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*Editor*
MAURICE A. SMITH D.F.C. and BAR

*Associate Editor*
H. F. KING M.B.E.

*Technical Editor*
W. T. GUNSTON

*Production Editor*
ROY CASEY

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## The Drop of a Hat

A MAN may rightly aspire to knighthood only through the merit of his achievements; and Vickers' George Edwards wrought valiantly and long, without trace of self-interest, before Her Majesty was lately pleased to raise him to the dignity of chivalry. But an aeroplane designed or sponsored by a man of such reputation and integrity may gain the highest recognition even before its birth.

The reflection is prompted by the acceptance by Trans-Canada Air Lines of the Vickers Vanguard, an airliner now being moulded in the character of the redoubtable Viscount: a worker and a winner.

Only a pedant would protest here that the Vanguard was not designed and sold by George Edwards single-handed; that on Rolls-Royce and many others, as well as on the Vickers organization, the honours must rightly fall; and that there was in any case a natural predisposition on T.C.A.'s part to order one Vickers/Rolls-Royce machine to succeed another.

All this we know well. But there is something else we know: that the operator's decision was founded upon a plain, immutable, incontestable fact—a fact which the nigglers and quibblers should have forced down their gullets three times daily. It is that T.C.A. chose the Vanguard for the reason that it was the best available aeroplane in the world to meet their needs. And the reason why it was the best aeroplane in the world for the job is that George Edwards in person took good care to see that this should be so.

We have, then, a double accolade to celebrate—a knighthood for the man; New World acceptance for the machine. And though we do not forget the admonition of Air Commodore Banks about the industry's partiality for throwing a party at the drop of a hat, we nevertheless rise (hatless) to propose the toast of The Vanguard, coupled with the name of George Edwards. The toast will not, we believe, go unhonoured.

## Pantobase

SADLY and often have we deplored Britain's neglect of marine aircraft, though we have always reasoned that they must be allowed to survive on their merits and not be preserved out of sentiment, like some exotic species of water-fowl. Their near-extinction, of course, is the result of financial stringency rather than spiteful repression; but while it may be true that our nation cannot afford fleets of aerial dreadnoughts, such as the multi-jet Martin SeaMaster (a 600 m.p.h. mine-layer) it is equally certain that we must continually review the possibilities of providing ourselves with marine aircraft in an economical manner.

One method of so doing—and at the same time of greatly extending the operational capabilities of selected aircraft—might be to investigate, in theory and practice, the "pantobase" formula as now under development by Stroukoff.

Diligent readers will recall that this scheme allows a high-wing landplane of medium or large size, and having the required propeller clearance, to be adapted to operate with equal facility from water, snow, ice or unprepared ground as well as from normal runways. It entails the sealing of the hull for flotation and the fitting of skis, for land or water use, extensible from the hull bottom. The normal retractable land undercarriage may be retained and outboard stabilizing floats must be fitted.

While we can be certain that pantobase possibilities have not been overlooked at Cowes, where Saunders-Roe, Ltd., have done a considerable amount of practical work on hydro-skis, it would be reassuring to know that the dictators of operational requirements, both military and civil, have the scheme closely at heart. It would be a shame if the Americans (as seems possible) should go on to evolve and exploit short-take-off, short-landing, turboprop transports and utility aircraft on the new principle, while the British Commonwealth (wherein one might expect the scheme to find wide and profitable employment) hobbled lamely and remorsefully behind.

# FROM ALL QUARTERS

## Woomera Developments

"A NEW project" by A. V. Roe and Co., Ltd., at the Woomera range, to begin early this year, was mentioned last week by Mr. Howard Beale, Australian Minister of Supply and Defence Production. The firm has taken over the laboratories at Salisbury, South Australia, recently vacated by Vickers-Armstrongs, Ltd.

Mr. Beale gave no further details, but went on to say that, in another new project, de Havilland (who have had a small team at Salisbury for some years) would be associated with representatives of Saunders-Roe, Ltd. (It will be recalled that a non-committal announcement of de Havilland Holdings, Ltd., having acquired an interest in Saunders-Roe, Ltd., was made early last November.)

The Minister added that British aviation and electronic firms now working at Salisbury totalled seven.

In a second statement, on Sunday, Mr. Beale disclosed that two special research rockets are to be launched from Woomera this year. One, the Skylark, developed by the R.A.E., is designed to carry equipment to a height of 100 miles or more. The Minister added that the "rockoon" method of launching rockets from balloons, already practised in the United States, would be used in Australia for the first time. The second rocket was one developed in Australia, and it would be launched as part of the joint U.K.-Australia guided weapons project.

## A 360 m.p.h. Beverley

IN a New Year message to employees of Blackburn and General Aircraft, Ltd., Mr. Eric Turner, the company's chairman, says: "Apart from the present version of the Beverley, which will be produced throughout 1957, you will be interested to know that we have just put forward proposals for modifying the Beverley to a turboprop version which would make it a long-range 360 m.p.h. machine without sacrificing its ability to operate from small, secondary airfields."

Mr. Turner adds, "Then there is the new aircraft, still unfortunately hidden under the cloak of security. Many more of you will be working on this during the coming year, and the quicker we get on with it the better it will be for us all. I believe that the aircraft will eventually go into widespread service at home and abroad, and when I tell you that in this class of aircraft we are ahead of anybody in the world, you will realize that the possibilities are tremendous if we pull together and make every post a winning post." [It may well be that the aircraft referred to by Mr. Turner is the new pure-jet carrier-borne strike aircraft ordered for the Royal Navy as a successor to the Wyvern.]

Mr. Turner declares further that the prospects of the company are better than at any time in its long history, "and for that matter," he adds, "better than those of many other companies in the industry."

As we go to press a news item from Brough states that two Blackburn-Turboméca Turmo 450 h.p. free-turbine engines are being consigned for delivery to Kaman Helicopters, of Bloomfield, Conn. They will be installed in experimental prototypes.

## The Mont Blanc Rescue Attempts

EIGHT men were rescued by two Alouette helicopters from a hut near the summit of Mont Blanc on January 3, following unsuccessful attempts to save two young climbers who had been trapped on the mountain for twelve days. The eight comprised the two-man crew of a Sikorsky S-55 helicopter, and two guides, who had crashed in the machine while attempting to rescue the two climbers on December 31, and four guides who had been lowered from another helicopter after the first had crashed.

The rescued men were flown to Chamonix, the two pilots suffering from shock and frostbite. Rescue operations for the two climbers, who were officially believed to have died of exposure on the night of December 31, were stopped on January 3, after the crashed S-55, in which the two men had been left for shelter, had been examined from the air by the French Secretary of State for Air. Hermann Geiger, the well-known Alpine pilot, had also flown over the helicopter in his Piper Cub, and had suggested further rescue flights. It was decided not to make the attempt.

## Lady Handley Page

WE record with regret the death, on January 2, of Lady Handley Page, wife of Sir Frederick Handley Page. As Miss Una Helen Thynne, she was married in 1918, the year in which Mr. Handley Page (who was knighted 24 years later) was made a C.B.E. There are three daughters of the marriage.

## R.Ae.S. Presidential Address

THE number of new members of the Royal Aeronautical Society enrolled during 1956 was more than double that of any previous year. This news was contained in the Society's presidential address by Mr. E. T. Jones, C.B., O.B.E., F.R.Ae.S., which was due to be delivered at Church House, Westminster, last night (January 10). A reception was to follow the address; we hope to give a full report of both functions in next week's issue.

Mr. Jones' address, which was devoted to a general review of "three related subjects—the aeronautical engineer, the world's oldest aeronautical society, and the world's newest form of transport," had this to say about guided weapons:—

"These new vehicles of the air, essential as they may be considered from the military point of view, are competing for a part of the limited aeronautical effort and facilities available and, while in the main they are expendable, they may prove useful stepping stones to other forms of air vehicle, and in any event they will certainly help in the further development of high-speed manned flight. In other words, just as the existence of the aircraft urged the development of nuclear weapons, so will these unmanned air vehicles provide data to accelerate further development of the aircraft."

## Armstrong Siddeley Reorganization

NOW responsible for the technical development of all products of Armstrong Siddeley Motors, Ltd., is Mr. W. H. ("Pat") Lindsey, M.A., F.R.Ae.S., who has been appointed technical director of the company. Since 1950 Mr. Lindsey has been chief engineer of the Aero-engine Division; his new responsibilities include diesel engines and cars.

*Mr. W. H. Lindsey.*

Mr. Lindsey joined A.S.M. from Cambridge in 1933. After graduate apprenticeship he worked as an assistant in the Research Department until 1940, when he was appointed research engineer in charge of his department. He was appointed deputy chief engineer in 1945, chief engineer in 1950, and a director of the company in 1952.

Following this latest appointment, the technical administration of the aero-engine division has been reorganized. Mr. A. Thomas, deputy chief engineer and chief designer, is now responsible for all design activity; Mr. J. Marlow, deputy chief engineer, will control all development activities (including flight development); and technical activities (including those of the performance section) will be under the chief technician, Mr. B. Slatter.

## Vulcan Report Anomalies

THE statement in Parliament on the Vulcan accident at London Airport on October 1 went only a little way towards explaining the real causes of the accident. In a leading article last week we commented on this fact, but took the figures published in the report at their face value. A Hertfordshire reader, Mr. J. M.

*EXPERT OPINION: Col. Bernt Balchen (centre foreground), the world-famous polar pilot, appraises the 9½ft by 5½ft nose ski for the Lockheed C-130A Hercules. The main skis measure 19½ft by 5½ft. All runners are coated with Teflon to prevent freezing of the ski to the snow. Polar tests of the Ski-130 are scheduled for next month.*

*MODERN PRACTICE: Special Saunders-Roe carriers for two 25 lb practice bombs are in service with the R.A.F. and Royal Navy. Aircraft fitted include the Venom, Hunter, Canberra and Sea Hawk. Above is a Hunter with one of the carriers on each of its inboard pylons (four pylons are fitted); right, the carrier in close-up.*

Wilde, has now made calculations which, based on these figures, suggest that a most curious situation must have arisen during the seconds which elapsed between the time the Vulcan pilot was told he was 80ft above the glide-path and the moment the aircraft struck the ground.

At three-quarters of a mile from touch-down the Vulcan should rightly have been 208ft above touch-down on the three-degree glide-path which was presumably in use. The pilot was told he was 80ft too high and it is therefore to be deduced that he was 288ft above touch-down. The aircraft struck the ground 1,000yd from touch-down, and therefore lost 288ft in a horizontal distance of 960ft. The actual distance travelled down the inclined flight-path was 985ft at an angle of 17 deg to the horizontal. Air Marshal Sir Harry Broadhurst, the co-pilot at the time, said, in a statement reported on this page last week, that the Vulcan hit the ground at 140 kt. At this speed the aircraft would have covered the inclined flight-path of 985ft in 4.08 sec—the staggering rate of descent of 4,230ft/min. Such a descent would almost certainly have forced the undercarriage up through the wing instead of sweeping the bogies off the legs as in fact occurred.

Conversely, the official statement says that some ten seconds elapsed between the three-quarter-mile point and the point of impact. This would result in the Vulcan's speed being about 64 kt. If the elapsed time was 7 sec the speed would have been 83 kt. Both these figures are entirely improbable in view of the type of damage caused to the undercarriage.

These calculations could lead to one of three suppositions, none of which seems altogether valid. The Vulcan might indeed have been stalled; it might have been dived or "mushed"; and the G.C.A. indications or instructions might have been faulty.

## Spare Our Blushes

AS this issue closed for press the following Reuter message was received from Washington: "American aviation experts have been surprised to find in the British magazine *Flight* a lot of information about the United States guided missile programme which they had not known before.

"Included in a special 'Guided Missile' issue of the magazine are details of a number of projects about which nothing had been released for publication here. *Flight* said that the United States has 'brought 30 families of guided missiles to the hardware' or production stage, and it listed many of them. Among the new or unfamiliar projects listed by the magazine were the air-to-air missiles BDM, Cherokee, Diamondback, Ding Dong and Skokie I and II; the air-to-surface missiles Bullpup and Dove, and the surface-to-surface missile Triton.

"Defense Department officials identified some of the listed projects as old ones that have been discontinued, and others as study projects on which nothing is said until they result in something useful. About several more of the projects listed by *Flight*, the Department had no comment to make."

While we are naturally gratified that *Flight* should have been the means of apprising American experts on new developments in their own field, we must, if only for the reassurance of our readers at home, place it on record that our guided missile review (December 7 last) was based entirely on a diligent collation and appraisal of available facts, and in no instance betrayed any secret or abused any confidence.

As we say, the Reuter message afforded us some quiet gratification—of the sort, incidentally, we experienced recently when we were shown a complete (pirated) reissue in Russian of our Iliffe publication *Development of the Guided Missile*, by Kenneth Gatland.

## H. L. Milner

WE record with regret the death, on December 19, of Mr. H. L. Milner, A.M.I.C.E., F.R.Ae.S., chief project engineer of Rotol, Ltd. Born in 1886, Mr. Milner was educated at the Manchester School of Technology and at London University, where he gained the Whitworth Scholarship. He served an apprenticeship with Armstrong Whitworth before joining the Royal Aircraft Factory at Farnborough for engine design duties in 1912. He remained in that post until 1922, when he joined Dr. Hele-Shaw and Capt. Beacham, who had ideas on the subject of a variable-pitch propeller. It was really Milner who translated those ideas into the first constant-speed variable-pitch propeller which was tested both at Farnborough and by the Gloster Aircraft Company. Mr. Milner next moved to the Bristol Aeroplane Company, where he developed propeller designs for the Mercury and Pegasus engines; thence, on the formation of Rotol in 1937, he went to the company as chief designer.

One of Mr. Milner's inventions was the propeller-blade integration machine, which worked out by mechanical means the correction which had to be applied to individual blades in order to suppress the vibration which naturally occurs. That machine, which was patented in 1941, was taken up by the R.A.F.

During the past ten years Mr. Milner had been project engineer at Rotol and had spent most of his time studying the future trend in propeller and accessory design.

## D.H. Engine Appointments

SUCCEEDING Mr. C. D. Beaumont as chief test pilot of the de Havilland Engine Co., Ltd., is Mr. J. M. Nicholson, who joined the company as a test pilot in June 1954, having previously been at A. and A.E.E., Boscombe Down. During the war he had flown Beaufighters in the Middle East, served as an instructor in Rhodesia, and been a Dakota pilot in Transport Command. Demobilized in 1946, he rejoined the R.A.F. three years later, obtaining an A.1 Instructor's Category at C.F.S. and serving in the Examining Wing before being posted to Boscombe Down.

*Mr. J. M. Nicholson.*

Mr. Beaumont, who retired on December 31, was first associated with D.H.s as an instructor at their White Waltham school in pre-war days. Throughout the war he served as an operational pilot, and on demobilization joined the de Havilland Engine Co. under John Cunningham (who was then in charge of engine flight testing). When Mr. Cunningham was made chief test pilot of the de Havilland Aircraft Company in 1946, Mr. Beaumont took over from him and has since been responsible for much of the development flying of the Goblin and Ghost and latterly of the Gyron in the Short Sperrin.

This change-over comes at a time when the Engine Company's flight development department under Mr. John Grierson is being expanded for intensive flight testing of new gas turbines and rocket motors. Assisted by Mr. Plenderleith (who is at the same time appointed deputy chief test pilot) and by Mr. Muir (who joined the company as a test pilot a year ago), Mr. Nicholson will be responsible for the continuing development of the Gyron and for the flight testing of the Gyron Junior and the Spectre.

*A new impression of the Vanguard, as it will appear in T.C.A. colours. Trans-Canada's aircraft will have a higher payload and gross weight than B.E.A. machines, with some structural differences in the wing.*

# VICTORY TO THE VANGUARD

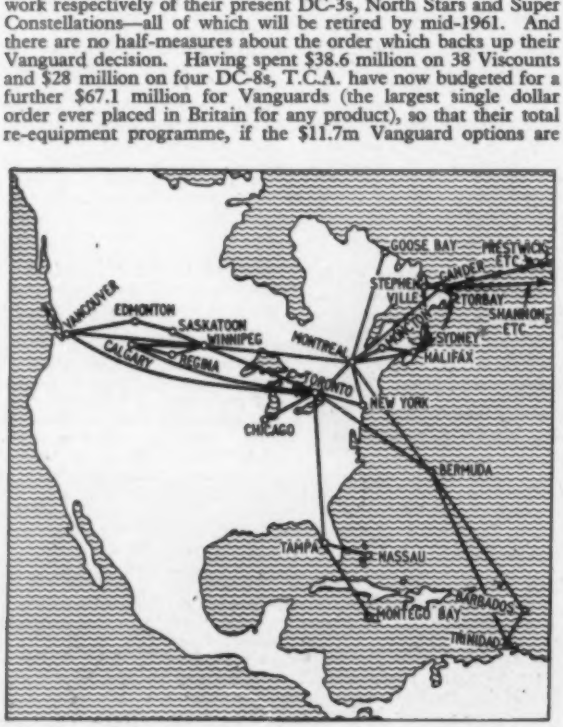
## *Background to T.C.A.'s Historic Order*

AS we briefly recorded last week, Trans-Canada Air Lines—after a long evaluation of six other competing short/medium-haul transports—have decided that the Vickers Vanguard is the right aeroplane for their domestic needs. They have bought 20, and hold an option on a further four.

For two years T.C.A., like many another airline, have been perplexed by the problem of what best to buy for the operation of the medium sectors of their network—the sectors where the bulk of their domestic traffic is concentrated. There is not, and probably never has been, any market in the business which is quite so confused by the number of types being offered, or by the conflicting ideologies of jet *versus* turboprop.

T.C.A. have been ardently wooed by seven firms, British and American. Perhaps no more so than a score of other airlines who have still to make up their medium-haul minds; but they are the first to have come up with a firm decision based on a purely technical assessment, uninfluenced by special considerations such as, for example, the need to steal a march on competitors over particularly rich routes.

Having decided, they have fixed the pattern of their "transportation system" for the next decade: a Rolls-Royce-powered all-turbine fleet of Viscounts, Vanguards, and DC-8s to do the work respectively of their present DC-3s, North Stars and Super Constellations—all of which will be retired by mid-1961. And there are no half-measures about the order which backs up their Vanguard decision. Having spent $38.6 million on 38 Viscounts and $28 million on four DC-8s, T.C.A. have now budgeted for a further $67.1 million for Vanguards (the largest single dollar order ever placed in Britain for any product), so that their total re-equipment programme, if the $11.7m Vanguard options are in fact taken up, will cost them no less than $145.4 million.




*All the domestic routes shown on this map may be flown by T.C.A.'s Vanguards; international routes will be shared between the airline's Vanguards and DC-8s. Not shown are the many short-haul routes which, in 1961, will be flown exclusively by Viscounts.*

Why did T.C.A. choose the Vanguard, and what might the effect of their choice be upon the waverers?

T.C.A.'s engineering team is acknowledged to be one of the most competent and respected in the business. "They are firm masters," Mr. George Edwards* has said, "and a highly efficient and exacting organization to work for. Their evaluation was as complete as I have ever seen in this business."

Their assessment and acceptance of the Viscount in 1952, and the resulting "Americanizing" design-changes made by Vickers, undoubtedly accelerated and strengthened the establishment of that aeroplane in the export market. And after T.C.A. had put the Viscount into service they came back with repeat orders on three subsequent occasions. The T.C.A.-Vickers-Rolls relationship was firmly cemented. Why, therefore, did the airline hesitate so long in choosing the Vanguard—a logical extension of an already well-established partnership?

There were, it appears, two very good reasons. One was the Lockheed Electra powered by Rolls-Royce Tyne turboprops; the other was the Douglas DC-9 powered by Rolls-Royce Avon turbojets. There was less to choose between the Vanguard and the Electra than there was between the turboprops and Douglas formulae, where a deep conflict of propulsion ideas existed. Nevertheless, it is no secret now that at several stages of their evaluation T.C.A. were very close to ordering the Electra—influenced perhaps by its earlier delivery date, the high-pressure salesmanship of its makers, and the fact that six airlines had already bought it (e.g., American and Eastern, T.C.A.'s competitors on routes to New York) and would have it operationally well-developed by the time T.C.A. would put it in service.

But it was Douglas with the DC-9 who, about nine months ago, lured T.C.A. and many other airlines away from their turboprop deliberations. Here, sponsored by the firm whose commercial experience and judgment command the profoundest respect, was a short/medium-range jet which appeared to offer nearly all of the turboprop's economy plus the jet's added advantages of higher performance and possibly superior comfort. And the DC-9 also offered something else especially tempting to T.C.A., who had decided to buy DC-8s for their long-haul transcontinental and transatlantic routes. This was the Douglas concept of the "paired jet transportation system," its two units, DC-8 and DC-9, being operationally—and to a very large extent technically—interchangeable.

There was also, it seems, a strong let's-get-rid-of-the-props body of opinion in T.C.A. which felt that a switch to jets for both medium- and long-distance work was a natural and logical evolution. But the sums showed otherwise. "The way the slide rules were clicking around the aviation building offices at T.C.A.," said Mr. Rod MacInnes, the airline's director of public relations, "made it sound like the 40th-street Pool Room at Winnipeg." The jet did not show up so well, at least so far as measurable quantities such as first cost (about 20 per cent more) and cost per seat-mile were concerned. There were two other non-measureable considerations which in time weighed the balance against

*See New Year Honours, page 50.

*Here, at Winnipeg, are a T.C.A. DC-4M North Star and DC-3—typical of the reliable but dating piston-engined equipment which, together with the airline's Super Constellations, will be entirely replaced by mid-1961 with a Rolls-Royce turbine-powered fleet. The view (right) of the impressive Vanguard mock-up—now sufficiently detailed to give a clear picture of the appearance of the aircraft—should dispel any misconceptions that the Vanguard is "just a bigger Viscount."*

the turbojet. One was cruising altitude, a critical air traffic control matter on T.C.A.'s busier traffic sectors, especially in the Maritimes. Another was that the DC-9, unlike the advanced Vanguard and Electra designs, was still only a project, with Douglas waiting upon U.S. domestic airline decisions to order it, and with delivery at least two years after the turboprops.

Yet another anti-jet consideration was that Vickers, alert to the challenge of the "baby" American jets (Boeing and Convair were trying them on the airlines too) had also drafted out jet projects to convince themselves as much as the airlines of what they believed to be the disparity in operating cost between the two forms of propulsion. As Mr. George Edwards said when asked about the so called "Vanjet" at a news conference last week: "We have done 80—or perhaps it is 100—projects on medium-range jets. With our experience of the Valiant we were able to evaluate the two forms of propulsion without relying on imagination. We just couldn't get seat-mile costs down to Vanguard levels . . . I know of no form of jet that will produce that standard of economy. But the confusion between jet and turboprop has up to now stopped people coming to the turboprop decision—and that's for sure."

Taking all these anti-jet considerations into account, one might argue that it is surprising that T.C.A. were influenced by the jet at all. Especially when one takes into account the significant fact that T.C.A. has no fear of jet competition—nor indeed of any competition—on its domestic routes, and therefore no inducement to pay a little extra for jets.

Nevertheless, the case for the jet, as a transport on its own merits and without the influence of outside factors, was very strong. It would, one feels, be wrong to conclude from T.C.A.'s choice of the turboprop that the medium jet's chances are "pretty skinny"—to quote (from another context) the recently expressed opinion of Mr. C. R. Smith, president of American Airlines. There are a good many airlines by whom the medium jet may yet be chosen (in addition to Capital, Delta, T.W.A., Air France and Aeroflot, who have already bought such equipment). We refer to B.E.A., and also to other still uncommitted big operators who have the necessary competitive stimulus in their networks, and big jets with which smaller jets could logically be paired according to the so-called "transportation system concept." Such operators are United, S.A.S., Swissair, K.L.M., and possibly Japan Air Lines.

T.C.A. will receive their first Vanguards—designated V.952—in September/October 1960, six months or so after first deliveries to B.E.A. All twenty should be on T.C.A.'s routes by July 1961 (where, incidentally, they will burn JP-4 fuel).

Though its basic formula was inspired by European traffic patterns, the Vanguard may be said to be thoroughly "Americanized" in its physical design. Everything that Vickers learnt about the North American market from the Viscount went into it so that, as was to be expected, T.C.A.'s change-orders were small—trivial compared with those made to the Viscount. They were, in fact, largely due to special domestic route-considerations (and will not apply to B.E.A.'s V.951s). Gross weight has gone up from 135,000 lb to 141,000 lb, mainly to accommodate more payload; and T.C.A. will be able to use 24,000 lb payloads instead of 21,000 lb (though with a minor penalty in structure weight). They wanted the higher payload (1) because of their heavy mail loads, which have precedence over passengers, and (2) because they required six-abreast seating for up to 120 "thrift"-class passengers. Zero-fuel weight, the payload limiting factor, has been increased from 98,500 lb to 104,500 lb, permitting high proportions of the capacity-payload to be used on the ultra-short sectors. Maximum landing weight is 114,000 lb, and the underfloor holds now total 1,435 cu ft, beating the DC-8 as the largest in any passenger transport.

Further structural modifications to the wing have been made to raise $V_{NO}$ at the lower altitudes which T.C.A. may have to use, particularly for flying the airways and rigid A.T.C. patterns of eastern North America. Take-off field length at the increased weights is little different from the original figures, thanks to yet another—and newly announced—five-per-cent increase in the power of the Tyne. The Stage-I engine, with which initial production aircraft will be fitted, is now up from 4,100 s.h.p. to 4,300 s.h.p. This engine will permit typical cruising-weight speeds at 20,000ft of 410 m.p.h.: the retrospective modification of these engines to Stage-II standard—which will start in 1961—will give powers of 4,830 s.h.p. or 5,315 e.h.p. (formerly 4,600 s.h.p.) and a cruising speed of over 420 m.p.h. Looking further ahead, Vanguard cruising speeds of 440 m.p.h. are foreseeable in 1962 when Stage-III engines are installed. When Mr. George Edwards was asked what the top limit of the Vanguard's cruising speed was likely to be, he replied: "I think 450 m.p.h. is in sight. This is realistic; but I dare say that if we calculated speeds like some other firms—unnominated—we could claim 465 m.p.h."

For Rolls-Royce, the T.C.A. order establishes them yet more firmly as the dominant aero-engine firm in the air transport business. Of the nine European and American turbine transports being built, seven will be exclusively or alternatively Rolls-Royce powered. These seven embrace every class of transport. They are: Fokker/Fairchild Friendship (Dart); Vickers Viscount (Dart); Vickers Vanguard (Tyne); Lockheed Electra (Tyne); de Havilland Comet 4 and 4A (RA.29); Sud-Est Caravelle (RA.29); Boeing 707 (Conway); Douglas DC-8 (Conway). As the firm's new chief executive, Mr. J. D. Pearson, pointed out last week, "more than a few crumbs" of the $229m dollar orders so far placed with Vickers have gone to R-R. Being interested in both forms of propulsion, Mr. Pearson is perhaps disinclined to discount the medium jet, particularly as the RA.29 fits the DC-9 so well. But he is sure there is "quite a large field" for the medium-range turboprop.

The following additional items emerged from the news conference at which the T.C.A. Vanguard order was announced: (1) Mr. Edwards said that "in the next thirty days or so" the $229m total of orders so far placed with Vickers for Viscounts and Vanguards would be raised to above $250m by new purchases. This indicates prospective sales equivalent to some 20 Viscounts (and they include at least one repeat-order). Further prospects for that aircraft, Mr. Edwards said, would take present orders from 357 up to around the 400 mark. (2) The Tyne has recently completed a 150-hour test, although it has not yet been put up for its type-test. Two Ambassadors are now being fitted with Tynes, and will be operated by B.E.A. on freighting duties to amass operational flying hours—following the precedent of the Dart-Dakotas in 1951 and 1952. (3) Sterling price of the Vanguard varies from £770,000 to just over £800,000, depending upon customer specification. Mr. Edwards, questioned about the apparent lowness of this figure, replied: "It is no use pricing yourself out of a market before you get into it." (4) T.C.A.'s Vanguards will accommodate passengers as follows: 82 first-class, 92 mixed-class (of which 56 will be tourist), or 120 "thrift"-class. The interior layout will include four washrooms and two galleys. (5) Asked whether the "Atlantic dream" was entirely out of the Vickers and Rolls-Royce minds Mr. Edwards replied, "It was an active dream once, but a fragrant memory now. I would be misleading you if I were to suggest that Vickers and Rolls-Royce are going all-out for the Atlantic." On the subject of a possible supersonic airliner, he turned to Mr. Basil Stephenson (newly appointed chief engineer, civil aircraft) and said, "We don't know how to do it yet, do we Steve?" (6) Vanguard production, all at Weybridge, is planned for four per month by October/November 1960. (7) Asked whether it was not curious and unusual for Vickers to have referred by name to a competing aircraft [the Lockheed Electra powered by Tynes], and had there possibly been some under-hand competition, Mr. Edwards replied: "No, there has not," adding wryly, "You should know that in our business everyone is covered in shining armour, with a heart of purest gold and gloves of finest kid."

# HERE AND THERE

*THE DUKE AND THE 'DRESSERS: As recorded last week, the Duke of Edinburgh recently watched a flying display of agricultural aircraft near Christchurch, New Zealand. His Royal Highness is here seen inspecting (left) the Edgar Percival EP.9 and (right) the Auster Agricola.*

### For D.H.110 Crew-training

FIRST M.o.S. contract for a D.H.110 simulator goes to F. G. Miles, Ltd. They are the first aircraft firm in Great Britain to enter the electronic flight-simulator field.

### Farnborough Date

DATES of this year's Farnborough Show have been announced by the S.B.A.C.—Monday, September 2 until Sunday, September 8 inclusive, with the usual public admission on the last three days.

### M.o.S. Appointment

APPOINTED Director of Aircraft Mechanical Engineering Equipment Research and Development, M.o.S., is Mr. E. A. Poulton. He succeeds Mr. R. Graham, due to retire last Wednesday.

### Wingless Wonders in the Way

PARTLY because a penguin population makes aircraft landings hazardous, the U.S. Navy is moving the site of its International Geophysical Year station in the Antarctic from Cape Adare to Cape Hallett, which is also more accessible by ship and provides a larger area for conversion into a landing strip.

### Rubber Industry President

NEW president of the Institute of the Rubber Industry is Mr. A. S. Bishop, managing director of the Goodyear Tyre and Rubber Co. (Great Britain), Ltd. Associated with the rubber industry for over 40 years, he played an important part in the introduction of the "giant" tyre for road vehicles in the early 1920s.

### Indian Ocean Staging-post

THE airfield on Gan island, in the Addu Atoll group of the Maldive Islands, is to be re-established by the R.A.F. and operated as a staging post, following consultation between the Maldivian and U.K. governments. The islands lie some 400 miles south-west of Ceylon, and the Gan base will ensure a direct air link from Britain to Australia and the Far East.

### Limited Snark Production

IN our "guided missiles" issue of December 7 last we remarked that it was unlikely that the Northrop SM-62 Snark bombardment missile would be built in quantity. On December 21 it was announced in Washington that the U.S. Air Force have placed a production contract; this is still not for a bulk quantity, but for "a limited number of continuing tests."

### Industry Comings and Goings

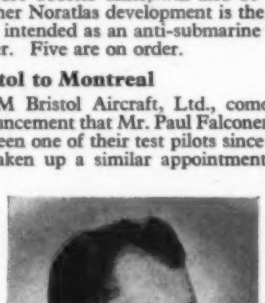
LAST week there was a spate of aircraft industry announcements of end-of-the-year retirements and New Year appointments. In addition to those detailed on other pages of this issue, the following moves have taken place and will be enlarged upon in our columns next week: Mr. W. A. Hargeaves has retired from the Board of Blackburn and General Aircraft; G/C. "Tim" Morice, Dunlop aviation sales manager, has retired; Mr. Ralph R. Warren is appointed Westland personnel manager; Mr. R. V. Browne goes to manage the new Avro research establishment at Salisbury, South Australia; Mr. A. I. Fenwick succeeds Lt-Col. L. F. R. Fell as public relations manager for Rolls-Royce aero engines; and Mr. Sidney E. Veale becomes Press officer to Napiers.

### New Noratlases

DESIGNATED Nord 2506, a forthcoming development of the French Noratlas twin-boom transport is to have slotted flaps to permit operation from shorter runways and an undercarriage partially retractable on the ground to afford easier access to the freight-hold. Air brakes, and possibly Turboméca Marboré booster units, will also be fitted. Another Noratlas development is the Nord 2504, intended as an anti-submarine crew-trainer. Five are on order.

### Bristol to Montreal

FROM Bristol Aircraft, Ltd., comes the announcement that Mr. Paul Falconer, who has been one of their test pilots since 1950, has taken up a similar appointment with



*Mr. Paul Falconer.*

Canadair, Ltd., in Montreal. (Canadair are building under licence a maritime reconnaissance version of the Britannia for the R.C.A.F.) Paul Falconer flew Mosquitoes in Bomber Command during the war, was subsequently posted to Transport Command, and on demobilization joined British South American Airways, flying Yorks and Tudors. He has some 5,000 hours on 58 types, including 500 hours on Britannias.

### Clear-water Spotter

SLOWED by ice in the Weddell Sea, the Trans-Antarctic expedition's motor vessel *Magga Dan* has been making good use of her Auster aircraft. S/L. John Lewis, O.C. the ship's R.A.F. detachment, signalled to the Air Ministry last week that the ship was entering heavy pack ice and that three reconnaissances had been flown. "Aircraft and ancillaries first class," he added. Later in the week S/L. Lewis made further sorties which enabled the vessel to find her way out of pack-ice three feet thick.

### "Open Skies" Dates

REVISED dates for some of the "Open Skies" photographic exhibitions in the provinces (see *Flight* last week, pages 4-6) are as follows: Manchester, February 5-11; Leicester, March 26-April 1; Belfast, May 20-28; Cardiff, June 18-24.

### Louis Blériot Lecture

THE production director of Sud-Ouest Aviation, M. Badré, is to deliver the Tenth Louis Blériot Lecture before the Royal Aeronautical Society on March 7. His subject will be *New Methods in Aircraft Production.*

### N.Z. Helicopters

UNTIL recently there were two helicopters in New Zealand, a Bell and a Hiller. Now another has been imported by an American concern, Kern Copters, Inc., who will initially undertake agricultural contacts and may later, with additional aircraft, extend their scope.

### I.A.S. President

THIS year's president of the Institute of the Aeronautical Sciences is Mr. Mundy I. Peale, president of Republic Aviation Corporation. He succeeds Mr. Edward R. Sharp, director of the N.A.C.A. Flight Propulsion Laboratory, and is the 25th president of the I.A.S.

### Oklahoma in Park Lane

A COLOUR film of America's National Aircraft Show at Oklahoma City last September will be screened at the Royal Aero Club's film show on Thursday, January 24 (Londonderry House, members and their guests only). The film was made by Mr. William Courtenay, who will give a commentary.

### Happy Inauguration

A NEW branch of the Vickers management mess came into use at Wisley on New Year's Day. Previously, test pilots and other members of the management staff at Wisley attended the Weybridge mess, which involved an eight-mile round trip by car each lunch-time. Guest of honour on the opening day was Mr. G. R. Edwards, managing director of Vickers-Armstrongs (Aircraft), Ltd., who was appropriately congratulated on his knighthood, which had been announced that morning.

"Flight" photograph

*In the gathering dusk at Laarbruch, Germany, No. 31 Sqn. ground-crews service their Canberra P.R.7s by the light of hangar-roof lamps.*

# ACHTUNG CANBERRA!

## *P.R.7s, B(I).8s and RB-57s on Duty in Germany*

By C. M. LAMBERT

THE Canberra is now launched on what might be considered the second phase of its operational life-cycle. When it started out, as a light bomber, it had capabilities which put it comfortably out of reach of fighter interception. It represented the swing of the performance pendulum in favour of the bomber. Canberra crews were able to laugh off attempted interceptions by anything then in general service; if it came to close quarters they could turn inside the intercepter, but more often they could merely sail by, comfortably above him.

A very considerable number of Canberra B.2s were built for the R.A.F. and altogether six other variants have gone into service or are expected shortly, and some of them still maintain a very useful edge in performance over their potential adversaries. But the absolute superiority of the type could not be expected to last. A closer appraisal of the Canberra's stronger points has now led to its adoption for rôles in which they can still be used to best advantage. Thus emphasis is being placed more and more on tactical use at night. While the P.R.9 will, one hopes, continue to excel at very high altitude, the B(I).8 is fitted out for the highly specialized night low-level intruder task; and, as an interim type, the B(I)6 is also following this road. The P.R.3 and P.R.7 are already established in the high-level recce field. The B.6s continue in their original rôle as light bombers, and T.4s are distributed both in O.C.U.s and squadrons for conversion and instrument-flying training. Many T.4s are conversions from B.2s, and this practice may be expected to continue and widen in scope, eventually resulting in an entirely-late-mark Canberra force.

During this time the Americans have produced large numbers of their own Canberra, the Martin B-57. The U.S.A.F. have followed rather the same pattern of operational development, with the difference that they began very soon to use the machine for photographic reconnaissance and night attack. And they also adapted it for the peculiar form of attack known as loft bombing or toss bombing, details of which appeared in *Flight* of October 19. This system is now reported to be under development for the R.A.F. as well, and the Canberra B(I).8 appears to be an obvious vehicle for it.

So the Canberra is set for its second phase—its tactical maturity. It could now prove a far more potent weapon than ever it was as a light day or night bomber. Upon it may rest the hopes and fears of many a military commander on both sides of any future conflict. As the Canberra was the despair of the intercepter of four years ago, so it might become the terror of the aggressor of the future—NATO's aiming eye and the straight left of its deterrent striking force.

Such were the conclusions we reached after a recent tour of Canberra units in Germany. We visited No. 31 Sqn. with P.R.7s, based at Laarbruch, No. 88 Sqn. with B(I).8s at Wildenrath and the RB-57 squadron of the 10th Tactical Reconnaissance Group, U.S.A.F., at Spangdahlem in 4th A.T.A.F. Each unit was carrying out its tasks in its own way, yet in each place we found the Canberra doing much the same job, looking much the same under a variety of paint schemes, and respected in much the same way by its various crews.

Few rôles can be more rewarding and instructive in peace time than photographic reconnaissance. The normal run of continuation training missions entails flights to all parts of a continent, the photographic records of which are something a crew or a squadron can take a pride in. No. 31 Sqn. has carefully developed this appreciation of its work by framing and exhibiting many of the incidental pictures taken during sorties. Since the P.R.7 carries only vertical or near-vertical high-altitude cameras, several pilots have developed the technique of banking their aircraft to take oblique shots at comparatively low levels. The perspective which results is curious; but the pictures thus obtained of towns, buildings and landscapes form an excellent decoration for squadron offices. The most recent pictures of general interest are displayed on a large board in the servicing hangar under the title *Out and About with 31 Squadron*. Some crews went out and photographed the royal yacht in the North Sea on its way to Stockholm. Rome, Cologne, Nijmegen, Dover, London, York, Brixham and Tyneside all appear in the great collection of current-interest pictures.

No. 31 Sqn. was re-formed at Laarbruch on March 1 last year and has been commanded since that time by S/L. J. C. Stead. It was the first unit in 2nd T.A.F. to receive Canberra P.R.7s. Under the control of No. 83 Group, it forms part of No. 34 Wing, a formation which was well known at the end of World War 2, when it flew Spitfires and Mosquitoes. The other two squadrons in the wing are Nos. 69 and 80, both with Canberra P.R.3s. Also at Laarbruch is the 306th Sqn. of the Dutch Air Force, with Republic RF-84Fs and Gs. This is a lodger unit and comes under the operational control of No. 2 Group. Each Canberra squadron has attached to it a Mobile Field Processing Unit, Nos. 3, 6 and 8 M.F.P.S. working for Nos. 31, 69 and 80 Sqns. respectively. Other R.A.F. reconnaissance units in No. 83 Group include No. 79 Sqn. (Swifts) and No. 541 (Meteor F.R.9s) both based at Gutersloh. No. 17 has recently been re-formed with Canberra P.R.3s at Wahn.

Unfortunately, little can be said about the capabilities, equipment and work of the P.R. squadrons. In common with all other Canberra units they are at present having a little tailplane-trim motor trouble, although modifications are steadily coming through and being incorporated, so that speed restrictions can be lifted. The crews are not particularly worried, since the trouble is well enough known to be relatively easily avoided.

During Exercise Stronghold, No. 31 Sqn. ranged over England, mostly at high level, and found that they were not entirely immune from well-flown Hunters. They feel that they would be safer flying right down close to the deck, where ground cover would give them much greater protection than would performance. But

*Three of No. 31 Squadron's Canberra P.R.7s in formation. They normally fly without wing-tanks and are painted silver.*

## ACHTUNG CANBERRA! . . .

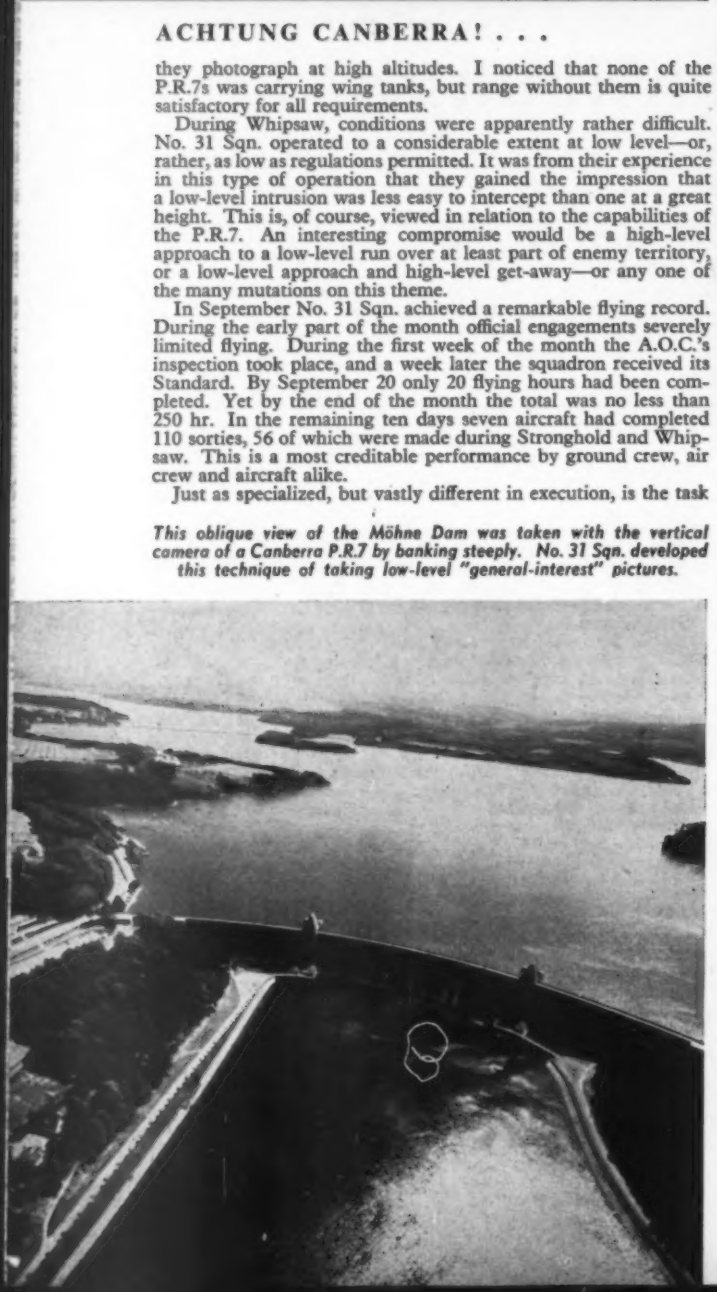
they photograph at high altitudes. I noticed that none of the P.R.7s was carrying wing tanks, but range without them is quite satisfactory for all requirements.

During Whipsaw, conditions were apparently rather difficult. No. 31 Sqn. operated to a considerable extent at low level—or, rather, as low as regulations permitted. It was from their experience in this type of operation that they gained the impression that a low-level intrusion was less easy to intercept than one at a great height. This is, of course, viewed in relation to the capabilities of the P.R.7. An interesting compromise would be a high-level approach to a low-level run over at least part of enemy territory, or a low-level approach and high-level get-away—or any one of the many mutations on this theme.

In September No. 31 Sqn. achieved a remarkable flying record. During the early part of the month official engagements severely limited flying. During the first week of the month the A.O.C.'s inspection took place, and a week later the squadron received its Standard. By September 20 only 20 flying hours had been completed. Yet by the end of the month the total was no less than 250 hr. In the remaining ten days seven aircraft had completed 110 sorties, 56 of which were made during Stronghold and Whipsaw. This is a most creditable performance by ground crew, air crew and aircraft alike.

Just as specialized, but vastly different in execution, is the task

*This oblique view of the Möhne Dam was taken with the vertical camera of a Canberra P.R.7 by banking steeply. No. 31 Sqn. developed this technique of taking low-level "general-interest" pictures.*



of the Canberra B(I).8. Its capabilities are really most intriguing and, even now, a good deal of operational development is still going on. No. 88 Sqn. at Wildenrath is equipped with these machines and their trials are phased-in with similar work being done by the B(I).6s of No. 213 Sqn. at Ahlhorn. No. 88 is a large unit and its commanding officer is therefore a wing commander—W/C. J. A. Holmes. Two squadron leaders command the flights. They are S/L. M. M. J. Robinson ("A" Flight) and S/L. D. A. Lloyd ("B" Flight).

When we visited the unit, No. 88 Squadron's crews were practising air-to-ground firing with the 4×20 mm gun pack mounted in the rear of the bomb bay. Two guns at a time were being fired at a standard 10ft-square ground target, aiming with a plain reflector sight. The pack is reloaded *in situ* with belts of ammunition, and only two of the four guns were fired on each sortie to facilitate a quicker turn-round. Later the crews will begin shallow-dive bombing with 25 lb practice bombs mounted on the underwing pylons or carried in the forward part of the bomb bay. The aiming will again be done by the pilot. Though there is provision for the standard high-level bomb-sight, the present use of the B(I).8 does not require this installation.

The main rôle of the B(I).8 is in fact night ground-attack work, for which the new crew layout has been specially designed. When

*A remarkable view of vapour trails forming behind a Canberra B(I).8 of No. 88 Sqn. over Germany. The trails forming behind the Avons are seen head-on, curving up and away to the right and fading out.*

flying at high speed and making the fullest use of the ground cover available, navigation is obviously of critical importance. For this purpose a navigator hidden away in an enclosed cabin behind the pilot would be of limited use; so, in the B(I).8, the single navigator rides in the nose of the aircraft and spends most of his time lying on his stomach map-reading through the transparent nose-cone. The pilot concentrates entirely on flying the aircraft. It is the task of Nos. 88 and 213 to develop a technique of pin-point navigation at night so that they can roar in to deliver a highly accurate attack with any of the variety of weapons they can carry, making just a single pass at the target. But for the navigator there is the great problem of darkness. On a brightly moonlit night it may be possible to achieve the necessary visual accuracy, but in overcast or moonless conditions there seems to be no alternative to dropping flares. This would not drastically increase the vulnerability of the aircraft so long as the first flare illuminated the target sufficiently to permit an immediate attack. An incidental difficulty in practising this technique is the fact that the local civilians quite naturally take most unkindly to sudden dazzling illuminations at night.

As an alternative to two 1,000 lb bombs, it is expected that the B(I).8 will carry rocket batteries on the under-wing pylons. At the moment the aircraft are all flying with gun packs; some carry pylons and a few have tip-tanks. The B(I).8's range capabilities are considerable, and by making the best use of the tip-tanks No. 88 Sqn. crews reckon they could cross the Atlantic from Wildenrath non-stop. For such a performance the tanks would have to be jettisoned as soon as they were empty, and at least a portion of the flight would be made at low level in order to avoid the reduction in climb caused by the extra fuel load.

To meet the low-level night commitment the B(I).8s are camouflaged on the upper surfaces and painted glossy black over the

*F/O. J. Heathcote of No. 88 Sqn. shows his gun-pack at close range while waiting his turn on the air-to-ground firing range. Obscured by glare in the extreme nose is his observer, F/O. K. Henderson.*
"Flight" photograph

## ACHTUNG CANBERRA! . . .

underside. These are the first Canberras seen to carry a plastic, as distinct from a metal, tailcone, suggesting the fitting of tail warning radar. Like other marks of Canberras the B(I).8 was, at the time of our visit, undergoing a number of modifications to correct or palliate run-away of the tailplane jack. Many of the aircraft, however, were fully modified and no longer restricted in any way in speed.

I asked whether, if the situation should require it, the B(I).8s could be "scrambled" for a close-support mission. No. 88 Sqn. thought this feasible for a short daylight mission which would not require a great deal of planning. But a high-speed, low-level night sortie would require extremely detailed pre-flight planning and, without it, success would be unlikely. For this kind of highly accurate low-level navigation the B(I).6 would have a slight advantage over the B(I).8, since it carried two navigators. One of them could lie in the nose and map-read, while the other could maintain a running plot with the assistance of radio aids; then, should the map-reader temporarily lose his bearings, the plotter could assist in recovering the situation. The single navigator of the B(I).8 had to stay down in the nose all the time, and once he was thoroughly lost his situation would be very much less hopeful.

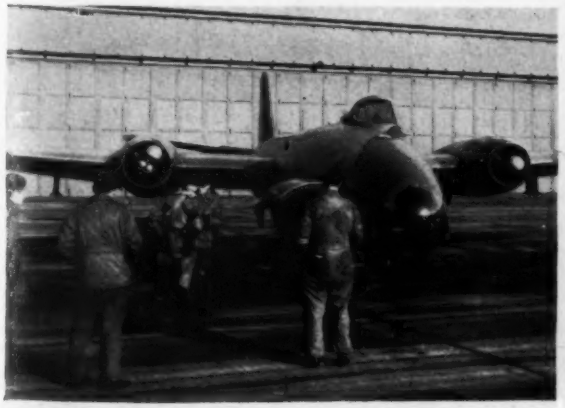
In the B(I).8 the pilot has a Martin-Baker ejector seat of the type traditionally fitted to Canberras; and those in No. 88 Sqn. were, at the time of our visit, being progressively modified to automatic standard. The navigator, on the other hand, must leave the aircraft through the crew access door on the starboard side, wearing a chest-type parachute and relying for a successful exit on the protection of a blast shield opening like an air-brake surface ahead of the door. This arrangement is in most ways anomalous, because the navigator's chances of successful escape at low level and high speeds are not as good as they might be, while the pilot would be loth to use his ejector seat before the navigator had got clear. In the present nose-compartment configuration it would be extremely difficult to fit an ejector seat for the navigator. In any case, he has to work lying down in the nose and, if anything drastic happened, he would not have time to get himself strapped into an ejector seat before it was too late. Opinions about this situation were divided, but few navigators seemed unduly concerned about it.

But perhaps the most interesting potentiality of No. 88 Squadron's B(I).8s is their possible use for toss bombing. W/C. Holmes simply observed that, if the Martin B-57 was used for toss bombing, then the B(I).8 would be no less capable of doing the same job. *Flight* of October 19 recorded a report that toss-bombing equipment was being developed for the R.A.F. Whether it be with this or with more conventional strike techniques, the B(I).8 must be prepared to play an important part in NATO's retaliatory strike plans. Either as part of a main striking force or as diversionary raiders, aircraft of this type would be in the thick of the great night battle which would most probably be a feature of any future conflict in Europe.

The Canberra picture would not be complete without a look at the U.S.A.F.'s version, the Martin RB-57. Accordingly we made a rapid visit to the U.S.A.F. base at Spangdahlem in the 4th

"Flight" photograph

*Only when silhouetted against smoke (as at right) or some other pale feature does the B(I).8 stand out from its background. Below, a crew prepares to take off for air firing. The three-cartridge engine starter breach can be seen on the starboard engine.*



*Bearing the distinctive arrow marking of the U.S.A.F.'s 10th Tac Recon Group, an RB-57A and an RB-57C of the Group's 1st Sqn. fly in close formation. Col. F. W. Dyer, the Group commander, who flies all four types of aircraft in his command, led this formation.*

## ACHTUNG CANBERRA! . . .

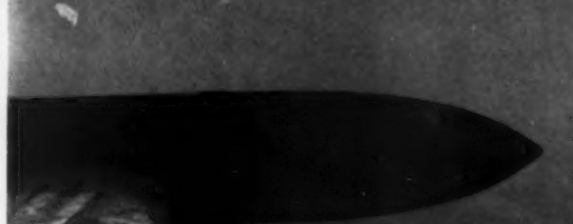
A.T.A.F. area, to see the 10th Tactical Reconnaissance Wing. It has three groups (a U.S.A.F. group is smaller than a wing), the Base Group, the Maintenance and Service Group and the 10th Tactical Reconnaissance Group, the wing's flying unit, in which our main interest lay. We were most hospitably welcomed by Col. F. W. Dyer, the 10th Group Commander, who has under his direction four units, officially named the 1st Tac Recon Squadron, Night Photo; the 32nd and 38th Tac Recon Squadrons, Day Photo; and the 42nd Tac Recon Squadron, a composite unit concerned with electronics and weather activities.

The 32nd and 38th Squadrons have RF-84F Thunderflashes for use in the standard range of day photographic missions; the composite 42nd Squadron has T-33s for weather recce and RB-26s for special reconnaissance. A number of the latter, bearing 42nd Squadron markings and fitted with many radomes and aerials, have from time to time been seen at Blackbushe, Surrey, and at various airfields in Germany. In *Flight* on December 21, the arrival of two RB-66Cs for the 42nd Squadron was noted. This variant of the B-66 is reported in America to have special reconnaissance equipment. The 1st Squadron also had RB-26s until about a year ago, when it converted to the RB-57s which were our main interest at Spangdahlem.

U.S.A.F. personnel are acutely aware of security restrictions and normally will say very much less about their aircraft than the manufacturers divulge even before the first flight of the prototypes. Thus I was able to learn very little about the operational work of the RB-57 Canberras. Every possible assistance was given to us in obtaining air-to-air pictures, but the photographs taken "on the flight line" were made only after the passes specially issued to both our American escorts and ourselves had been examined by the ground-crews working on the aircraft. Armed sentries stood guard over the aircraft—as they do at every operational U.S.A.F. base in Germany.

The 10th Wing's operational tasks are varied. By day they are to provide visual and photographic reconnaissance; destroy hostile forces; spot and control artillery fire; fly tactical and defence sorties; provide aerial photographic coverage for map-making; and carry out other tasks on request. By night they provide visual, photographic and radar reconnaissance; observe and photograph bomb damage; provide synoptic and weather control; and fly other missions on request. First- and second-phase photographic processing and interpretation is done at squadron level, but a reconnaissance technical squadron, including a mobile field photographic processing unit, takes care of additional production and requirements.

The RB-57s flown by the 1st Tactical Reconnaissance Squadron (Lt-Col. J. K. Graham) are of three types, the A, B and C variants. The RB-57A is in many respects equivalent to the British P.R.3 except that it carries fewer cameras, has the Martin rotating bomb-



*Below, an RB-57A's Wright J65 Sapphire gets a dramatically smoky cartridge start at Spangdahlem. The two pictures at right show the main differences between the RB-57A (upper) and C. Both have the rotating bomb-door, shown half turned on the A, but only the C has four 20 mm cannon in the wings. Individual aircraft markings, such as the splendid "Nite Mare," are widely used.*

*The 10th Tactical Reconnaissance Group at Spangdahlem has amassed a great collection of general-interest air-to-ground pictures similar to those made by No. 31 Sqn. at Laarbruch. This one shows the Colosseum at Rome, flanked by the Arch of Constantine.*

## ACHTUNG CANBERRA! . . .

door and is capable of ground attack work as well as night photography. Because of the night commitment all the 57s are finished in glossy black, with identification signs in red. The Group insignia is a plain arrow on a broad band across fin and rudder, each squadron using a different pair of colours; the 1st uses black on white. I was also delighted to see each aircraft wearing its own individual emblem on the forward fuselage in the World War 2 tradition. Excellently painted (and characteristically American), they stand out well against the glossy black finish.

The RB-57B is a more advanced version, still retaining the cameras and rotating bomb-doors, but having completely rearranged crew accommodation. The two men sit in tandem under a large blister canopy which hinges up on its after end under hydraulic power. Visibility forward from both seats is very good; so much so that the RB-57C, which has dual control, but retains the same canopy, can be comfortably flown from the back seat. For the landing the rear pilot need look only slightly to one side over the front pilot's shoulder to see properly. Both men have ejection seats. This arrangement has also allowed the extreme nose to be given over to a radar scanner, though this is not fitted in 57Cs at Spangdahlem. In common with most English Canberras the tail warning radar is not yet fitted, though the tail cone is of dielectric plastic and unpainted.

Both B and C versions have provision for four 20 mm guns, mounted in widely spaced pairs just outboard of the engine nacelles. Cameras are probably carried fore and aft of the bomb bay since the bay itself is apparently reserved for bombs, rockets and flares. Instead of the single under-wing weapon pylon of the B(I).8, the "57" carries four mountings for air-to-ground rockets under each wing. Some of the machines had the usual Canberra tip-tanks. The RB-57A crew compartment appears to be in all respects similar to that of the B.2, having the single-piece transparent nose-cone, with bomb-aimer's window inset, of late English examples.

The tandem crew layout would seem to provide all the answers sought by the B(I).8 arrangement, with the advantage of ejection seats for both men—and the possible disadvantage of space limitation for equipment-control panels in the rear cockpit. Although the 57C is used mainly for pilot training and instrument flying practice, it can double as an operational aircraft if the need arises.

The Americans, too, were having trouble with tailplane actuator motors and suffering some speed restrictions, but modifications were coming through. This shows just how similar the British and American versions are as regards the airframe and its equipment. It was noticeable that the Martin structural layout on such units as flaps, undercarriage and skin panelling followed English Electric practice remarkably closely, with the obvious exception of the major Martin departures in cockpit and bomb-bay layout. But the most striking point about the RB-57 is that it has been equipped to do the job of both the P.R.3 and the B(I).8. In fact, the Americans showed us a collection of air-to-ground "tourist" photographs very similar to those taken by No. 31 Sqn. while also admitting that their task would include missions similar to those of No. 88 Sqn. Their machines are, of course, equipped for toss-bombing, a technique suited to accurate low-level delivery of atomic weapons.

About Canberra handling the Americans were quite enthusiastic. They like the combination of easy handling and high performance and consider it to be a very forgiving aircraft. One could well understand this feeling, for there must be a considerable difference in tolerance to mishandling between the Canberra and, say, the RF-84F or the RB-66C; and the docility of the Canberra must be a very real asset in low-level night flying.

The 10th has quite a history behind it, dating from its formation in September 1941, before America entered the war. It was known as the 73rd Observation Group, but its existence, either as an active formation or on paper, has been continuous, though it was not designated the 10th Tactical Reconnaissance Wing until December 1947. Five years later it was moved to France and, in 1953, it took over its present base at Spangdahlem. After the war it adopted the slogan "first on D-day, last on VE-day." Wing aircraft flew 232 missions over the invasion area during the 15 days preceding D-day—some of them at heights as low as 15ft—and claimed to have shot down the last enemy aircraft in Europe—at 2000 hr on May 8, 1945—and to have flown the last operational sortie on the same day. Altogether 13,915 sorties were flown and 94 enemy aircraft were destroyed at the loss of 57. Photographs brought back by the Wing's pilots played an important part in the planning of the break-through at St. Lô; and for their work over coastal defences before D-day the Group (as it then was) was awarded a Distinguished Unit Citation which all personnel of the 10th are entitled to wear.

Present equipment and organization leaves no doubt that the 10th would put up an equally fine performance if it were ever sent into action for NATO. The night sky would certainly echo the ringing note of the RB-57's Wright-built Sapphire engines, the flash of photographic flares or the sudden sound and fury of stealthily delivered low-level attacks.

## A STORY—AND ITS SEQUEL

WHEN we took the Victorian novel *The Outlaws of the Air* as the foundation of a Christmas feature in our issue of December 21 we little suspected that our lighthearted offering would have a remarkable real-life sequel.

A telephone call from *Evening Standard* air correspondent James Stuart apprised us that George Griffith, the author of this "aeronautic masterpiece" (as H. G. Wells called it), was the father of none other than Dr. A. A. Griffith, chief research engineer of Rolls-Royce, Ltd., acknowledged as one of the outstanding aeronautical engineers of our time. (Dr. Griffith's paper *The Aerodynamic Theory of Turbine Design*, written when he was at the Royal Aircraft Establishment in 1926, was a classic contribution to gas-turbine development, and his name has more recently been associated with vertical-lift aircraft, the precursor of which is the Short SC.1.) Jimmy Stuart had learned of the kinship in an interview with Dr. Griffith some months before, and his disclosure prompted us to ask Dr. Griffith himself for some account of his father's life. This he obligingly set down in such admirable style that we reproduce it as received, in the knowledge that it is not only of absorbing interest in itself but is also an important contribution to the records of aeronautical literature:—

"The account which I can give you of my father's life [Dr. Griffith writes] is, I fear, somewhat scrappy; he died when I was 13 and my mother was a tidy soul who believed in destroying papers which seemed to have served their turn.

"My father was born in 1857, the son of George Alfred Jones, an Anglican curate whose parish was somewhere in Lancashire. It appears that the family name was Griffith Jones, but my grandfather ordinarily used the name Jones. As far as I have been able to make out, my father used the two names indifferently until 1894, when he changed to Griffith by deed poll. Before that, he had used the name Griffith as a *nom-de-plume*.

"At the age of 16, my father deserted the parental vicarage, made his way to Liverpool and signed on before the mast in a ship bound for Australia. Thus started a period of wandering which lasted for some years, involving more than one journey round the world, and during which he acquired fluency in several languages and a love of the sea which he never lost.

"On his return to England he was apparently reconciled with his

(*Concluded at foot of page 46*)

*Top, a Douglas RB-26C used for special reconnaissance by the 42nd Tactical Reconnaissance Squadron, U.S.A.F. The squadron forms part of the 10th Tactical Reconnaissance Wing based at Spangdahlem, Germany; a description of the RB-57s flown by another of the Wing's squadrons is on page 40. The second machine is the 8-year-old Supermarine 510, originally VV106 and now (as a ground trainer at R.A.F. Station Cardington) numbered 7175M. It has a variable-incidence tail cone and tailplane.*

# AIRCRAFT INTELLIGENCE

### Great Britain

*Hunting Percival Pembroke C(PR).1.* This is the designation of the survey Pembrokes now being operated from Seletar, Singapore, by No. 81 Sqn. The aircraft are used for reconnaissance concerned with the anti-bandit campaign and for mapping or casualty and freight flying. The same squadron operates Meteors.

### U.S.A.

*Boeing B-47.* Last month the Boeing plant in Wichita, Kansas, delivered the last of more than 1,300 B-47s to the U.S.A.F. Strategic Air Command. At the end of production more than 3,800 suppliers and sub-contractors were feeding the Wichita plant. Production is continuing—although on a progressively reduced basis—at the Douglas plant at Tulsa and the Lockheed plant at Marietta, both of which have built a comparable number. All three factories are heavily committed to follow-on programmes.

*Convair F-106A.* The first all-weather intercepter of this type (a development of the F-102) was test-flown from Edwards Air Force Base on December 27. It is claimed to be equipped with the most advanced electronic fire-control system and armament yet developed for a U.S.A.F. intercepter. The initial $83 million contract for F-106As was announced by Convair last summer.

*Douglas C-133A.* The third of these giant multi-purpose U.S.A.F. transports is now well advanced in acceptance trials at Edwards A.F.B. The second machine flew for the first time on September 22 and, after logging 91 hr 30 min, has been returned to the Douglas plant at Long Beach where it will be prepared for climatic tests at Wright-Patterson A.F.B. and in the freezing hangar at Eglin A.F.B.

*Lockheed CL-257.* The foregoing is the designation of a project for a new early-warning Super-Constellation intended to succeed the developments of the 1049 now in service. A saucer-shaped radome, now being tested experimentally on a WV-2E, will be mounted on this new Super Connie.

*North American F-86 Sabre.* Nine years' continuous production of the F-86 Sabre closed a few days ago when the last machine of the type (an F-86F) left the North American assembly line at Los Angeles. Production is still continuing, however, in four other countries, and more than 6,000 Sabres, built by North American at Los Angeles and Columbus, Ohio, continue in service with the U.S.A.F. and Air National Guard units. The first Sabre was flown on October 1, 1947, and the first production model—the F-86A—was in the air seven months later. Production of the F-100 Super Sabre continues at both North American plants. The F-86F lines have been converted to F-100Fs (two-seater Super Sabres) without the lay-off of a single worker or the loss of a day's production.

*Sikorsky H-37A.* Known commercially as the S-56 and bearing the U.S. Navy designation HR2S-1, the Sikorsky H-37A for the U.S. Army is expected to have a normal useful load of nearly 9,500 lb. The maximum load will be well in excess of 11,000 lb. The empty weight of 19,704 lb, reports *Aviation Week*, will bring this helicopter well within the 20,000 lb limit set for Army helicopters by the Defense Secretary.

*Stroukoff YC-134.* A development of the C-123 Provider, this "pantobase" transport incorporates boundary-layer control. In a recent demonstration at Trenton it was airborne in 418ft.

### France

*Fouga CM.170 Magister.* Air Fouga formally announce an agreement with the German Government for the supply of 382 CM.170 Magister twin-jet trainers. A quantity of these will be made by Fouga at Blagnac, near Toulouse, and the German Heinkel company will manufacture the type under licence. At first major assemblies will be delivered by the French firm, but later all components will be German-built. All items of equipment will be supplied by France. The German contract brings the total of Magisters now on order to 577.

*Nord 2501 Noratlas.* The first of 25 Noratlas twin-engined transports for Germany left Le Bourget on December 17 for Memmingen (Bavaria). The delivery of these machines will precede the construction under licence of 112 examples by Flugzeugbau Nord (Norflug), which is an organization formed by the Hamburger, Weser and Siebel companies. All 137 Noratlas will be fitted with Bristol Hercules engines built by SNECMA. Half of the accessories are being supplied by France and half by Germany.

*S.E. 210 Caravelle.* The second Caravelle twin-Avon jet transport is undergoing testing of its ventilation, pressurizing, air-conditioning and soundproofing systems. The radio is also involved. Some 250 hours' flying already stands to the credit of this machine.

### Italy

*De Bernardi Aeroscooter.* Col. Mario de Bernardi, the famous Italian pilot, is flying the little Aeroscooter which he designed. He is now performing aerobatics with it and is trying to solve the problem of finding a good 30–40 h.p. engine; he also intends to develop a two-seat version. The lines of the diminutive first prototype have been considerably cleaned up for production, but there is no news of when the autogiro rotor (which was earlier proposed for this machine) is to be fitted.

*Nardi FN.333.* The first prototype, which completed a series of test flights from Bergamo airfield last month, is back in the factory so that advantage can be taken of bad weather for inspections and modifications.

### Japan

*Helicopter Production.* Home production of S-55 and S-58 helicopters is now being studied by Mitsubishi Heavy Industries Reorganized, Ltd. Hitherto the company had been studying the production of only S-55 components. Already sixteen S-55s (twelve for the ground forces and four for the maritime forces) are to be imported under the current Defence Agency budget.

### Netherlands

*Trainer Evaluation.* Now undergoing evaluation by the Government Aviation School at Eelde, in the north of Holland, are a Beechcraft Mentor, a Piaggio P-149 and a Saab-91C. Machines of the finally selected type will replace Tiger Moths and Harvards. It may be recalled that the P-149 has been ordered by the German Air Force and that the type will be built in Germany by Focke Wulf.

### Argentina

*Beechcraft T-34 Mentor.* The Government of Argentina has signed a contract valued at $4 million with the Beech Aircraft Corporation for the production of T-34 Mentors. The first licensing and technical-assistance agreement between a United States aircraft manufacturer and Argentina since the war, the contract calls for the purchase of about ninety T-34s and spares under a programme extending well into 1959. Argentina thus becomes the seventh foreign country to acquire Mentors for military applications (others are Japan, which also holds manufacturing rights, Chile, Colombia, El Salvador, Turkey and Canada—another licensee). The T-34 is a standard primary trainer of the U.S.A.F. and U.S. Navy, and was developed by Beech as a private venture.

# Aeroflot and Minhaiduy

## *Lifting the Curtain on Air Services in the U.S.S.R. and China*

By J. MUIRHEAD JOHNSTON, B.A. (Editor of "The ABC World Airways Guide")

DURING the last twelve months or so information concerning the air services of the U.S.S.R. and the Chinese People's Republic has become much more up-to-date and extensive. Moreover, the Tupolev Tu-104, which caused a stir when it first visited London last year, is currently going into service on certain routes. Thus it seems opportune at this time to present a brief survey of civil air transport operations in these two countries.

The name Aeroflot, by which the Russian national airline is known, is an abbreviation of a title which could be translated as General Department of Civil Air Fleet at the Council of Ministers of the U.S.S.R.; such, in fact, is the description printed in the latest edition of the carrier's timetables. This organization controls the whole civil air fleet of the U.S.S.R. and is responsible not only for the operation of normal scheduled services but also for a wide variety of other duties, including crop spraying, ambulance services and special charters. The name Minhaiduy, abbreviation for the Civil Aviation Administration of China, is probably not as well known, for the airline was formed comparatively recently and is at present in process of building up its route network. Another small airline in the Far East is that operated by the Ministry of Communications of the Korean Democratic Republic under the name Ukamps, but very little information concerning its operations is currently available. Let us, then, first examine the scheduled operations of Aeroflot, which is by far the biggest and most important of the three carriers and operates a much larger and more extensive network than the others; indeed it must rank among the world's largest scheduled operators.

Aeroflot maintains a considerable number of international routes to the capital cities of countries in the so-called Communist bloc, although during the last year or so these routes have been extended to certain other countries; indeed, the service between Moscow and Helsinki in Finland has been in operation for some eight or nine years. Of these international routes the largest group is that linking Moscow with numerous cities of Eastern Europe, and some of these are now operated jointly with the national carriers of the various states served; during the last few years Soviet participation in the organizations of these carriers has been progressively withdrawn.

On the route Moscow-Vilno-Prague (formerly operated *via* Minsk instead of Vilno) Aeroflot maintain three and CSA one daily service in each direction. Operation of one of the Aeroflot flights is now being taken over by Tu-104s, which omit the intermediate landing at Vilno and accomplish the journey in two-and-a-half hours, compared with slightly over seven hours by other aircraft. Tu-104s are at present operating twice weekly, but this frequency will be progressively increased to daily.

Between Moscow and Berlin, *via* Vilno, Aeroflot maintain daily flights in each direction, with additional services calling also at Warsaw on three days of the week. Reciprocal services are flown by the East German Deutsche Lufthansa seven times weekly on the route Berlin-Warsaw-Vilno-Moscow, whilst the Polish Airline, LOT, operates four weekly flights in each direction between Warsaw and Moscow, three non-stop, the fourth calling at Vilno.

After a period of suspension occasioned by the difficulties between the U.S.S.R. and Yugoslavia, services to Belgrade have been re-opened, and six flights weekly in each direction are made on the route Moscow-Kiev-Lwow (Lemberg)—Budapest-Belgrade; this line continues from Belgrade to Tirana twice a week. Although the Yugoslav Airline, JAT, does not yet operate between Belgrade and Moscow, such a service is provided for under the Soviet-Yugoslav air agreement. There is also a thrice-weekly service on the route Moscow-Kiev-Lwow-Budapest-Vienna; since the withdrawal of the occupation forces from Austria Aeroflot has used Schwechat Airport at Vienna, thus providing direct links with all the other carriers serving this city.

The last of this group of services is that from Moscow *via* Kiev-Odessa-Bucharest to Sofia, operated nine times weekly. An interesting feature of the services on most of these routes is that some flights in the outward direction from Moscow are restricted to mail and cargo traffic, although all inward flights also have accommodation for passengers. It is reported that Aeroflot will shortly extend this network by the addition of a new line, Moscow-Bucharest-Athens-Cairo.

The most recent development has been the conclusion of reciprocal agreements between Aeroflot on the one hand and Finnair and S.A.S. on the other for the joint operation of services between Scandinavia and the U.S.S.R. As a result of this the Helsinki-Moscow route is now flown four times weekly by Aeroflot and twice weekly by Finnair, schedules having been co-ordinated to provide services on six days a week at standard departure times. The agreement between Aeroflot and S.A.S. provides for four flights weekly on the route Moscow-Riga-Copenhagen and a similar number *via* Moscow-Riga-Stockholm, extended to Oslo once weekly by S.A.S. Operation of these flights is shared equally by the two carriers and Aeroflot provide immediate connections four times weekly between Riga and Leningrad.

The other main group of international routes operated by Aeroflot consists of services to the Far East. There are two daily flights in each direction from Moscow to Peking *via* Kazan, Sverdlovsk, Omsk, Novosibirsk, Krasnoyarsk, Irkutsk and Ulan-Bator (Mongolia). One of these is operated throughout by Aeroflot, whilst on the second service the sector Irkutsk-Ulan-Bator-Peking is flown by the Chinese operator Minhaiduy. In the outward direction a night-stop is made at Irkutsk by all services, and there is an additional weekly flight each way between Moscow and Ulan-Bator. Services to the North Korean capital of Pyong Yang are maintained six times weekly by the same route to Irkutsk and thence to Chita, where night stops are made in both directions; between Chita and Pyong Yang intermediate calls are made at Hailar, Harbin and Shenyang (Mukden) in North-east China (Manchuria), and this sector is operated alternately by Aeroflot and Ukamps. Another connection with China is made *via* Alma-Ata, whence local services are operated twice weekly to Ili and Urumchi in the Eastern province of Sinkian; this route is operated jointly by Aeroflot and Minhaiduy.

The remaining international route of Aeroflot consists of a twice-weekly service from Moscow *via* Uralsk, Aktyubinsk, Dzhusaly, Tashkent (where a night stop is made) and Termez to Kabul; here connections are available with the services of Indian Airlines Corporation to Delhi and Calcutta.

### Domestic Network

A glance at the map overleaf shows that the main concentration of Aeroflot domestic routes lies in European Russia. In addition to the international lines serving these cities there are daily flights from Moscow to Kiev and Odessa, twice daily between Moscow and Kiev, whence numerous routes fan out to the cities of South-west Russia. Traffic to the Black Sea ports and resorts is heavy; there are twice-daily flights between Moscow and Mineralnye-Vody and between Moscow and Adler (serving the resort of Sochi) and daily flights from Moscow to Tbilisi (capital of Georgia), Sukhumi and Simferopol. Most of these flights make intermediate calls at one or more of the important cities of Voronezh, Kharkov, Stalino and Rostov-on-Don; but since October 15 there has been a once-weekly non-stop service on Mondays by Tu-104 between Moscow and Tbilisi; this takes two-and-a-half hours instead of the usual eight.

The longest domestic trunk route is that between Moscow and Vladivostock, some 7,500 km (rather over 4,600 miles), which follows the Far Eastern route across Siberia to Chita, whence it continues *via* Tygda and Khabarovsk alternatively to Vladivostock or Yuzhno-Sakhalinsk. Recent details of the schedules for this route are not available, but there are certainly several daily services throughout as well as many additional flights terminating at various intermediate points. The most recent development on this route was the introduction on September 16 of a Tu-104, which flies three times a week in each direction between Moscow and Irkutsk with a single intermediate landing at Omsk in an overall time of just over seven hours. At Krasnoyarsk and Irkutsk branches leave the main line for Kirensk and Yakutsk in the north-east.

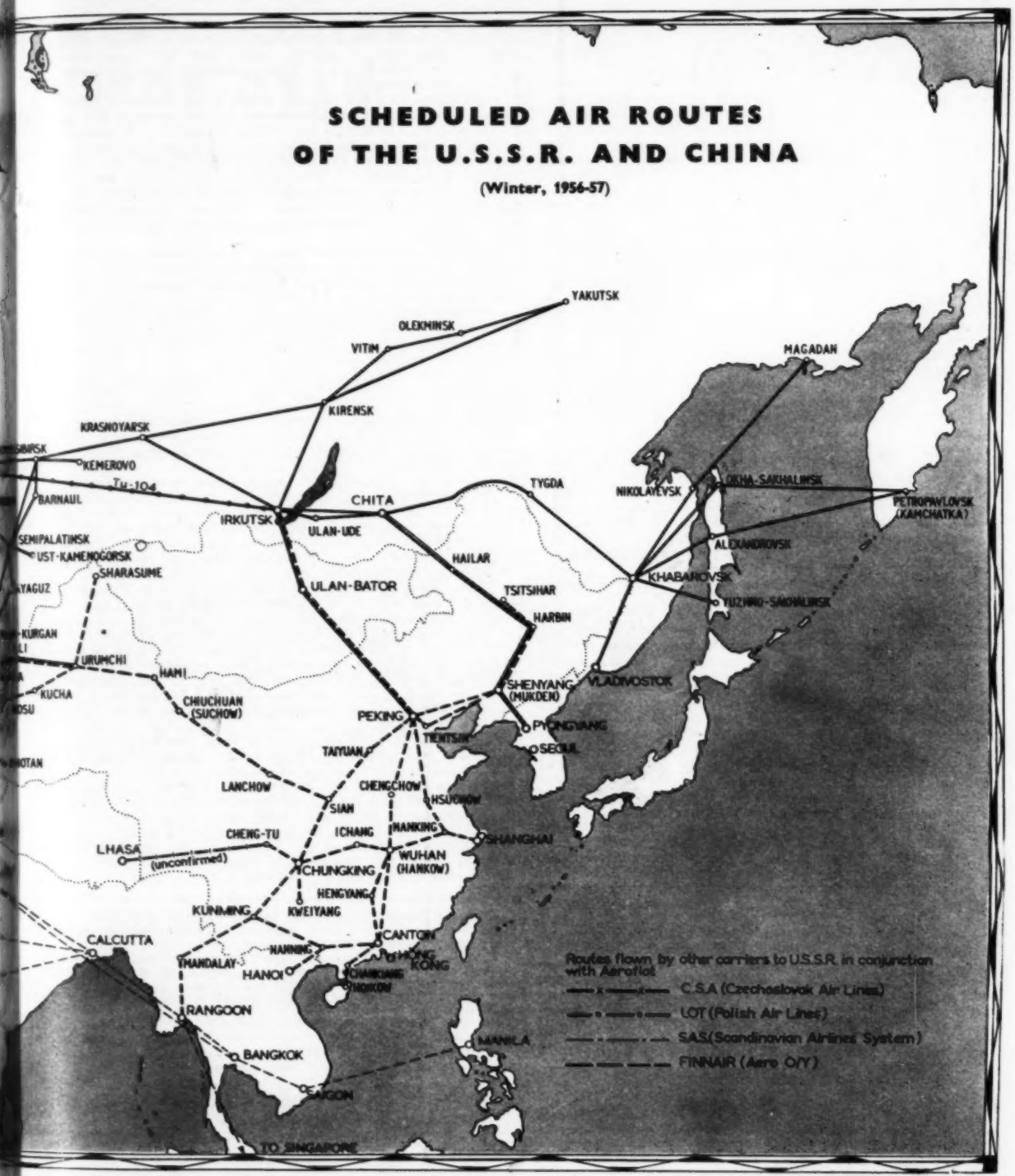
In addition to the through service to Kabul there are also daily flights between Moscow and Tashkent *via* Uralsk, Aktyubinsk and Dzhusaly; a regular Tu-104 service flying non-stop between these two important cities in four hours has operated every Wednesday since October 17. There are also daily services between Moscow and Alma-Ata *via* various intermediate points and between Moscow, Stalingrad and Baku. In addition services from both Moscow and Leningrad are operated to Archangel and Murmansk in the Far North; Leningrad is also linked directly with the Black Sea area *via* Minsk and Kiev.

[*Cont. overleaf*

## AEROFLOT AND MINHAIDUY . . .

The map shows that there are numerous cross-country lines in the western area of Russia linking important cities in the south-west with the main points in Siberia, and there is a southern trunk route from the Black Sea *via* the Caspian to Tashkent and Alma-Ata. It is not possible to give an accurate idea of the traffic over these lines, since recent schedules are available only for a limited number of the Aeroflot domestic routes. Moreover, the route-map itself probably gives an incomplete picture of the extent of the Russian network, although it has been prepared from a recent map issued by Aeroflot and brought up-to-date in accordance with the latest schedules. Fairly complete timetables of six or seven years ago include many intermediate points not shown on the map and a number of other local services radiating from important centres.

Apart from the routes mentioned as operated by Tupolev twin-jet airliners, the majority of the Aeroflot services are currently flown by Ilyushin Il-12 aircraft—now being replaced on many routes with the slightly larger and faster Ilyushin Il-14s—and by Lissunov Li-2s, the latter being the Russian-built Dakota (a licence was granted during the war). It is believed that certain




smaller aircraft, such as the Yak-18, may still be in use on some local routes.

The Tu-104 has been fully described and evaluated in earlier issues of *Flight*, and no further comment need be made here except that its introduction on the long-distance trunk routes will considerably reduce journey times and will bring to Russian travellers for the first time the comfort of a pressurized cabin. The Il-12 has been seen in the U.K. on several occasions and its general specification is fairly well known; it is not unlike the Dakota, but is provided with a tricycle undercarriage. The Il-14 is, as already mentioned, little more than an improved version of the Il-12, whilst the Li-2 is almost identical with the Dakota.

A point of interest is that, according to an official Aeroflot description, the Il-12 is normally fitted with only eighteen seats and the Li-2 with a mere fourteen; this would suggest that a good deal of the fuselage space is devoted to the carriage of mail and cargo, and an earlier remark suggests that these form no inconsiderable proportion of the traffic generally. There are, nevertheless, certain express passenger services, particularly to the Black Sea resorts, for which the aircraft are presumably fitted with rather more seats. With the exception of the short connection between Alma-Ata and Urumchi and the sector from Chita to

## AEROFLOT AND MINHAIDUY . . .

North Korea, all Aeroflot international services have been operated for some time by Il-12s and are now being taken over by Il-14s.

Recent information concerning passenger fares on domestic routes is that considerable reductions are now being made, although these will be smaller on trunk routes than on local services. Moreover, a round-trip discount of 10 per cent is to be introduced for the first time, return fares having previously been double the single. The latest fares lists available at the time of writing do not reflect these changes, but it is noted that only one rate is now quoted for domestic flights, whereas for many years there were both first- and second-class fares, relating to soft and hard seats respectively. Indeed, it is believed that Aeroflot was the first airline to carry passengers of two classes in one aircraft.

All international services into Moscow and a large number of domestic flights, including those operated by Tu-104s, use Vnukovo Airport, the remaining lines operating to and from Bykovo; it is believed that these two airports now handle all Moscow's scheduled flights. Vnukovo is reached from Sverdlova Square by a bus service operating from five in the morning until 45 min after midnight; the usual time to be allowed for the journey and for formalities at the airport is a little over two hours. To Bykovo electric trains operate from the Kazanshogo Station throughout most of the day and night, the only break being from 0135 to 0515. It is clear, therefore, that both Moscow airports are fully equipped for night operation as, indeed, are those serving the principal cities throughout the U.S.S.R.; this is revealed by the scheduled times of arrival at and departure from these places.

The arrangements for pool services with Finnair and S.A.S. also involve interline agreements for through bookings from any point on the network of one carrier to any point on the other's system. Aeroflot has recently concluded a number of further interline agreements with Western carriers and the following are known to have such arrangements with Aeroflot: Air France, Air India International, B.E.A., Czechoslovak Airlines, Finnair, Yugoslav Airlines, K.L.M., Polish Airlines, Hungarian Airlines, Minhaiduy, Pan-American, Sabena, S.A.S., Swissair, Bulgarian Airlines, Roumanian Airlines and Ukamps.

Special mention should be made of the Air France/Aeroflot service Paris-Prague-Moscow, for this connection was achieved by careful co-ordination of schedules to offer one-day travel between Paris and Moscow in both directions. The introduction of the Tu-104 has brought about a cut in the journey time making it the fastest link between Western Europe and Moscow. It has been reported that the Tu-104 will eventually continue eastward from Moscow to Novosibirsk to connect there with flights to Peking, thus providing a very rapid through service to China. As a result of the Aeroflot agreement with Air India International it is possible to book through from Russian cities *via* Kabul to points in Southeast Asia and Australia.

It may be that, as suitable competitive aircraft become available to the Russian carrier, further reciprocal agreements with Western carriers on the lines of these with Finnair and S.A.S. will be negotiated. The Tu-104 would appear to fill the bill and we may see these aircraft flying regularly to London, Paris, Amsterdam, Brussels and other Western European capitals. Hitherto the Russians have been not unnaturally reluctant to operate such reciprocal routes with aircraft inferior to those available to their competing partners.

The international routes of Minhaiduy to Alma-Ata and Irkutsk in co-operation with Aeroflot have already been described. Other routes to points outside China are a weekly service flown with Il-14s from Peking *via* Kunming (night stop) to Mandalay and Rangoon and weekly Li-2 flights from Canton *via* Nanning to Hanoi in North Vietnam. The Burma service provides excellent connections in both directions at Rangoon with B.O.A.C. flights on their Europe-Far East route as well as with the services of other carriers. Unconfirmed reports suggest that there may now also be a line from Peking to Lhasa, capital of Tibet, probably flown *via* Chungking.

The Chinese domestic network is now being developed; principal routes include four-times-weekly services between Peking and Canton *via* Chengchow and Wuhan (Hankow) and between Peking and Shanghai *via* Hsuchow and Nanking; eight weekly flights between Peking and Chungking *via* Taiyuan and Sian, two of which continue to Kunming; and four weekly services between Peking and Lanchow *via* Taiyuan and Chengchow, continuing after an over-night stop to Chuichuan (Suchow), Hami and Urumchi, where connections are made with flights to other cities in Sinkian.

In addition to several other local services there are also flights four times weekly between Chungking and Shanghai and once weekly between Chungking and Canton, both *via* various intermediate points as well as the Northern route from Peking, with some flights operating *via* Tsientsin, to Shenyang (Mukden), Harbin and Tsitsihar. Aircraft employed on these lines are mainly Li-2s, although Il-12s and Il-14s are now making an appearance on a few of the principal lines.

The service at present touching the city of Hailar in North China is the joint Aeroflot/Ukamps line between Chita and Pyong-Yang. The winter, 1956, edition of Minhaiduy's timetable contains two new domestic routes; a twice-weekly service between Kweiyang and Chungking, where connections are made to and from Peking and other cities, and a weekly service from Urumchi to Sharasume in the far North of Sinkian province. It is rumoured that a new international service to Japan may be opened shortly.

The vast distances involved in travel in the U.S.S.R. and China are favourable to the growth of air transport as the accepted means of transport; moreover, the fact that much of this huge area is very sparsely populated militates against the development of good surface communications. Official comparative figures published by Aeroflot show clearly the immense saving in time achieved by air travel. From Moscow to Vladivostock the air journey occupies an overall time of 40 hr 35 min compared with 220 hr 5 min by train; from Moscow to Irkutsk in Siberia the corresponding figures are 19 hr 5 min (now 7 hr 10 min by Tu-104) and 119 hr 40 min; from Moscow to Adler (Sochi) the aeroplane takes 5 hr 15 min and the train 47 hr 19 min, whilst Tbilisi is reached in 8 hr by air (2½ hr by Tu-104), the train requiring 68 hr 40 min. Tashkent is reached by air in 10 hr 40 min (Tu-104, 4 hr) and Alma-Ata in 14 hr 50 min, the corresponding train times being 94 hr 35 min and 118 hr 25 min.

Even on the relatively short route between Moscow and Leningrad there is a substantial saving, for the aeroplane takes only 2 hr 35 min against the train's 10 hr 50 min; to Kiev the times are 2½ hr and 24 hr 7 min respectively. The most spectacular difference of all is for the journey from Alma-Ata to Balkhash, on the northern shore of the lake of the same name; the air journey takes a mere 1 hr 25 min, whereas the circuitous route involved in surface travel requires no less than 138 hr! It is small wonder, therefore, that the present very extensive air network has developed and is still steadily growing.

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**Postscript:** Since this article was written a once-weekly service has begun to operate from Prague to Peking *via* Moscow, Omsk and Irkutsk every Friday; the return flight (covering the same route) is on Sundays. It is now possible to fly from Peking to Prague by Aeroflot and connect at Prague with an Air France service to Paris all in the same day. Departure time from Peking is 0735 and arrival in Paris 2020 (both local time). Thus there are now three services weekly between Prague and Moscow.

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## A STORY—AND ITS SEQUEL (continued from page 41)

parents and became a school teacher, again in Lancashire. It was during this period that he met and married my mother, Elizabeth Brierley. Speaking from memory, this was in 1887. Soon after he gave up teaching to become a journalist, and moved to London.

"Because of his love of travel, he sought assignments which took him abroad. One of these was a trip round the world in 48 days, after the style of Jules Verne's story. This was quite an achievement because, at the time, the Trans-Siberian Railway was incomplete, so that part of the journey had to be done by sleigh. Another journey took him in search of the source of the Amazon and on a third he became the first foreigner to gain entry to the French convict settlement at Noumea. On his last foreign assignment he went with Joseph Chamberlain to South Africa after the war.

"It was in 1893, the year of my birth, that he was persuaded (I believe by Peter Keary) to try his hand as a novelist and *Natasha: the Angel of the Revolution* was the result. My Christian names, Alan Arnold, were taken from two of the characters in this book. From then to his death 13 years later he wrote 37 books, all but three of which were, I believe, novels. I do not know what actually started his interest in flight, but he was certainly acquainted with Maxim and was also caught up in the ballooning craze. I was told that he crossed the Channel on one flight.

"He was a keen sailor and in 1901 (I think) he moved to Littlehampton, the better to indulge in this pastime. I often went with him on fishing expeditions and the like.

"After a few years the declining popularity of his books compelled retrenchment, and we moved to Port Erin, Isle of Man, where he died in 1906.

"There is no doubt that my father's vision and imagination touched off my own interest in flying and probably that of others as well. In retrospect, however, what strikes me most forcibly about the visionaries of the past is that the reality of today should have so far outstripped their wildest dreams (as they were thought to be at the time).

"In *Olga Romanoff* the greatest flight speed that my father could foresee for the year 2035 A.D., was 600 m.p.h. and now the world speed record stands at nearly twice that figure. Again, his most powerful explosives, which turned steel to powder, are insignificant compared with modern nuclear weapons. Finally, although Hertzian waves were already known, not one of the imaginative writers of the time had a glimmering of the way in which they were to transform communications."

# WEST COAST STOP-OVER

## *Talking Medium-haul Shop at Lockheed and Douglas*

By J. M. RAMSDEN

### Part I: A Day at Lockheed

IN a London bus last summer I sat next to an American visitor engrossed in a booklet entitled *Do Europe In A Week*. I didn't engage him in conversation because, quite clearly, his programme did not allow for the intrusion of natives. So I let my imagination stray to the page he was reading. Westminster (whither we were bound) had, I visualized, been allocated a total sight-seeing time of fifteen minutes by the hands of Big Ben, to include five minutes for the Abbey, one minute for the Abraham Lincoln memorial, and five minutes for the Houses of Parliament.

Or was this visitor, I wondered, so sated with sight-seeing that, thinking he was in Rome, he was swatting up the Eiffel Tower?

I had occasion to recall these thoughts when, just before Christmas, I flew by B.O.A.C. and American Airlines to Los Angeles with the intention of doing Douglas and Lockheed in one day each. I realized that, to avoid biting off very much more than I could chew in the short time I had available, my programme would have to be a selective one. Much more worthwhile to savour a small but prudently chosen morsel than to choke myself in trying to gobble up the whole vast spread, tempting though this might be.

The morsel I chose to taste was the present philosophy (current thinking, if you prefer it the American way) of each firm upon a subject which, I think, interests most people in the air transport business today—the medium-haul airliner market.

Within the vast geometric sprawl of Los Angeles, only an hour's drive from each other, reside the two firms which between them have supplied the world's airlines with 80 per cent of their capacity. The rivalry between Douglas and Lockheed, stimulated no doubt by their physical proximity as well as by their customers, has been the subject of many a fable; it has also resulted in the creation of a wonderful series of transport aeroplanes. Curious, then, that eighteen months or so ago the competitive temperature dropped when the two firms decided to build totally different classes of transport—Douglas the long-haul pure jet DC-8 and Lockheed the medium-haul Electra.

But it was not long before rivalry was restored—and more keenly than ever before. Douglas, encouraged by the response to their DC-8, drafted out a junior version of their big jet to try out on medium-haul carriers. It was not the first jet to be offered to them, but it came from Douglas, and the dogma of the turboprop creed was strongly challenged.

In Los Angeles today, therefore, are the most influential champions of two fundamentally different formulæ for the future prosperity of the medium-haul airlines. They can't both be completely right; and I wondered, *en route* to the West Coast aboard my overnight American Airlines DC-7 Royal Coachman, which one—if either—I would find to be more right than the other.

This was, I must confess, my first visit to an American aircraft company, and I found myself imagining how it would all compare with Bristol, Hatfield or Weybridge. The Editor and two other colleagues, Bill Gunston and Arthur Bowbeer, had been to the West Coast at various times during the past couple of years, and their descriptions—or in Arthur's case drawings—of what they saw had heightened in my mind the legend of Lockheed and Douglas might. Would my American hosts—who as specialists in the art of being in a hurry would be sympathetic to my shortage of time—be ready for *Flight's* latest visit with a suitably prepared "hustle program"? No doubt a "Do Douglas In A Day" brochure would be available at Santa Monica, and obviously there would be no time at either firm for the leisurely tea-drinking preliminaries *de rigeur* for a business call on, say, Bristol.

As it turned out, of course, I was disabused of my highly coloured imaginings. There was no high-pressure hustle—but each firm had arranged for me an intensive programme to ensure that every minute of the few hours I had available would be rewardingly spent. As it turned out, at both Lockheed and Douglas I saw and discussed all I wanted to—and possibly more.

I had chosen to visit Lockheed on the first day, mainly because I have English friends working there: they met me at the airport in their 220 Mercedes, and we drove to the plant in the soft early morning sunshine of a Californian December—a pleasant hour's journey through the city and across the Santa Monica mountains. Because my flight was late I had unwittingly made my friends rather overdue for the office: normal starting time for Lockheed staff, I whistled to hear, is 7.30 a.m. Finishing time is 5.15 p.m.—a five-day, 44-hour week, excluding overtime, which in most of the key Electra technical offices is at the moment a mandatory four hours.

In the main Lockheed office block behind the Air Terminal I was cleared for security and given a badge, with two mysterious yellow and black buttons on it, to pin to my lapel. Every Burbank employee has his security pass—usually tucked into the waistband, where it is less likely to be stolen—and entry through a Lockheed portal is barred to anyone who cannot produce this Pentagon-inspired device. (Mr. Hall Hibbard, himself, I was told, has been challenged on several occasions. This probably accounts for the distinguished portrait of senior Lockheed executives which I noticed at one check-point.)

I was impressed by the tightness of the security system. An armed but affable commissionaire (who resembled the U.S. traffic cop more than he did the homely British works policeman) politely but firmly asked me to open my briefcase and to hand over *Flight's* Leica. "You English?" he asked. "Tough about that gas rayticning over there."

My host was Warren Hughes of Lockheed's News Bureau. We hadn't met before but were well acquainted with each other's signatures, mine on the letters seeking information about Lockheed, his on prompt replies providing it. I had often been intrigued to see what an American aircraft firm's news bureau was actually like. I had pictured rows of multigraphing machines and men in green eye-shades grappling with telephones and ticker-tapes: I discovered it to be much like the less impressively entitled "press office" back home.

Plush is the word which best fits my impression of Lockheed's business offices. Like the interior of the Electra, they have the "living-room look." Light and spacious, deep-pile-carpeted and most tastefully furnished (and every one at the time of my visit with its own Christmas tree) they are yet unmistakably places of business. Office architecture is contemporary in design, but not so extremely so that in a few years' time it will look *démodé*, and predominantly pale green in colour.

Warren said, "I know something that'll interest you," and took me into an office where two pretty shorthand-typists were transcribing a tape-recording of the previous evening's address to the Lockheed Management Club by C. R. Smith. I had not before heard the voice of the president of American Airlines, although I knew his writings well, and had invariably found them excellent value. In this room the two girls, having smiled hullo, ceased work to let me hear the rich, hesitant voice of this wise old man of American aviation: "Since the date of the Electra decision, nearly two years have gone by. There has been plenty of time for reflection, plenty of time to accumulate the wisdom of the Monday morning quarterback. We believe no other airplane will do so well the specific task for which the Electra was designed. . . . When

## WEST COAST STOP-OVER . . .

you get down to the mathematics of the short- and medium-distance runs it is very difficult to see that there is a place for the small jet. Prospects that the small jet will be built are pretty skinny. I doubt if enough of them can be sold. . . ."

This was strong stuff coming from someone who has no axe to grind and who, until he bought the Electra from Lockheed, had done business with Douglas since the DC-2. I must say it was as pleasant a way as any in which Warren could have got me properly conditioned for turbopropaganda yet to come.

Warren then took me to meet his chief, Lockheed's director of sales promotion, Bert Holloway. We talked mostly about *Flight* ("a magazine," he made me laugh by remarking, "in which I sometimes detect a pro-British flavour"), and in particular about the November 23 issue, which he had wryly opened at our article on Lockheed's high-altitude mystery machine the U-2.

We were joined at lunch by Leonard Schwartz, who is Lockheed's director of commercial sales, and the driving force—with the accent on the drive—behind the marketing of the Electra.

The view he took of the short/medium range jets was crushing in its mildness: "I find the case for them," he said, "rather difficult to understand"; but of course they had a limited application for people who could afford to run them. This had more effect on me than a more elaborate debunking of the rival product would have done. I don't know whether other people feel the same about this as I do, but I don't like to be subjected to a table-pounding tirade upon the disadvantages of the opposition product. This kind of salesmanship only gets people's backs up, and the more elaborate and smirking it becomes the more it weakens its own case.

Schwartz explained how the Electra had begun as the answer to the need for a transportation system (I had expected that phrase to find its way into the discussion sooner or later) and how the project had begun as a short/medium-hauler to key in with the big jets. Then the customers wanted more range as well to tide them over long-haul-wise in the interim period before the big jets came in. So Lockheed tried tip-tanks, then the wing got bigger, until eventually they found themselves with a "better airplane for both worlds"—with more wing area and more tankage. I didn't query this, but I did wonder whether you really can bake a short-haul cake for eating over long-hauls as well. But this was to be answered for me later by Mr. Hibbard.

Schwartz went on: "Now we are finding that the foreign airlines are looking at the Electra as a long/medium-hauler. You've got to remember," he said, "that there are a lot of airlines who just want something for the class of work their Constellations and DC-6s are doing." I knew what he meant: big jets aren't needed by what one might call the second-class carriers of this world, where much of the potential business lies. "But what do you mean by a this-or-that-hauler?" he asked. "I don't know, and I don't think anyone really does. But 0 to 700 miles is roughly how we aim the Electra; it's a proposition beyond 1,200 miles, and it can do coast-to-coast as well."

I asked him about United, still the only one of the U.S. Big Six still uncommitted to a short/medium hauler. "They are worth watching," he said. "It might be the DC-9 or the Electra—I hope the Electra." United's president Mr. Patterson, he said, had always been very conservative, and had rarely done anything "different"—except four-abreast coach seating, which hadn't worked. They might do something different in their purchase of medium-haulers. The implication was obviously that United might buy DC-9s as partners for their 30 DC-8s, and I got the impression that United's decision would be a very significant one.

I asked about Electra delivery date, which I knew had gone back a few months. He said they would fly in February 1958 (previously October 1957) with first deliveries to Eastern in October 1958. American, until now the first to be due for delivery (in August 1958) would be second, and would start to get their aeroplanes as from January 1959. The reason: American were prepared to accept the delay incurred by the so-called living-room-look (about which more anon). I thought also to myself that Mr. C. R. Smith will not mind in the least letting his old friend Eddie Rickenbacker get the aeroplane "route-debugged" first.

*Thousands of Electra parts like this panel for an exit door frame are now coming off the machines at Lockheed. Full-scale assembly began on January 4, and the first aircraft will be completed in December and flown in January, 1958.*

I asked Mr. Schwartz whether he thought that the development programme for the Electra—eight months from first flight to delivery—allowed too small a margin for delays. His answer was straightforward enough: "We think we shall do it." I gathered that the programme involves the use of six production aeroplanes, and that the scale of systems rig-testing and engineering mock-ups (see later) is unprecedented in Lockheed history. He was "very happy" about the way Allison were getting on with the model 501 D-13 engine, which was now really piling up the flying hours in C-130s. A D-13-engined 1049 would fly in July, and the aim was to amass—with C-130 flying included—800,000 engine hours before an Electra delivery. About the Tyne he said: "We are going for this engine, and I believe it will extend the market for the Electra considerably, especially in sterling areas."

A most enlightening lunch. Even more enlightening was the hour which ensued. Warren had arranged for me to see Mr. Hall L. Hibbard, Lockheed's senior engineering vice-president, another man whose writings and quotations I have come to heed and to respect. He is responsible for Lockheed's big technical decisions, and although there is a very strong business side to Lockheed's top management, I got the impression that the opinions expressed by Mr. Hibbard—who although an engineer first has a keen sense of business, too—are the ones that carry most weight around Lockheed.

He has an unassuming, almost diffident warmth of manner, and an infectious enthusiasm—rare among engineers these days—for his aeroplanes. He talks in a broad, "the way I see it" sort of way, now and then getting down to a detail which shows how he has looked at the core of the problem as well as at its rounder terms. He spoke of the Electra in its present form as the continuation of the Constellation and DC-6 class; how its range ability was sufficient to handle the class of work these aeroplanes were doing now, but with the improvement in economy that every new aeroplane must show. Its "prime region" however was short- to medium-haul. What that was precisely he couldn't say—nobody could say—"but up to 700 miles is the region we are pointing at with the Electra."

### Electra Mk 2?

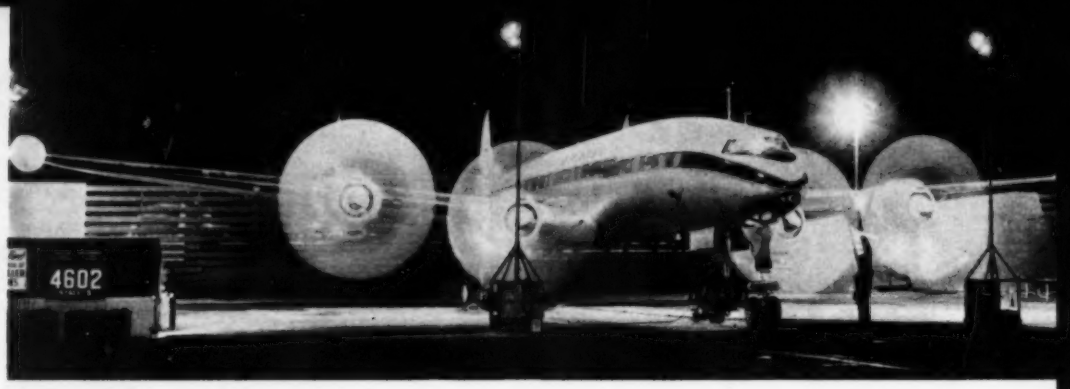
For the first time in their history, he said, Lockheed were considering a transport development which was down on range—a new version of the Electra, with the greater capacity of a pulled-out fuselage but with less wing structure. "We are trying out airline reaction; as with Douglas, half our commercial sales are foreign, and we never decide on a move unless we are certain it is right for the foreign airlines." He would not say yet how the new version, if he decided on it, would be phased in with production of the standard Electra, but he did recall how the airlines had said "you've gone crazy" when Lockheed decided to drop the 649 for the 1049—a decision which proved to be right.

I asked about the Tyne, feeling that the Electra development to which he had just referred brought the aeroplane even closer in conception—big capacity for best short-haul economics—to the Vanguard. "We are definitely going for the Tyne," was his reply. "It is a dandy engine and it makes a dandy airplane—a better airplane." As for the Vanguard, there was no doubt about the market for it. It was a "fine airplane," and Lockheed had the greatest respect for Vickers. The Electra and the Vanguard were different, but not that different. "I personally am very glad of the competition—it keeps us on our toes. It's something we've always had from Douglas; it's done us good, and I believe it's done them good, too." The same applied to the engine competition between Allison and Rolls.

I asked when we might expect to see Lockheed in the pure-jet airliner business. His reply was to the effect that, though Lockheed were conscious of having been out of it until now, I wasn't to imagine that this state of affairs would continue. "The wonderful thing about the aviation industry," he said, "is that no sooner do you say about a new development 'Well, that's it for a while,' than the doors open and you see the next stage all set and in place." Lockheed were looking at the supersonic airliner, and everything was falling into place just perfectly. "I say that the industry—and I hope it's Lockheed—will have a prototype flying in eight years' time, and in operation four to five years after that." He considered that Mach 2 was the bottom limit: "I should say 2.7 is about right." It would, he said, "go some ways."

I can't adequately describe the thoughts that these words, confidently and almost casually spoken, put into my mind. I think they went something like this: "I'll accept all that only from the firm which made the F-104." I asked about airport and thermodynamic problems. "We would have plenty of power for take-off," he replied, "plenty of wing for very-high-altitude cruise, and certainly jet flaps [blown flaps] and reverse thrust for landing." He did not think there would be an airport problem, and V.T.O. did not enter into his supersonic thoughts. "As for the thermal barrier, sure it's right there, but we'll just fly above it." He mentioned a 100,000ft cruising height, and I knew what he had meant when he said it would go some ways.

"We think everything is fitting into place just perfectly," Mr.




***Super Constellation production at Burbank, against both civil and military orders, continues at full pressure. Demand is likely to keep production going up to the end of 1958 at least.***

Hibbard had said. Assuming that when he said "we" he was referring to Lockheed and not to the aircraft industry as a whole, we can reckon that his firm, with their resources and military F-104 experience, are as well placed as any to translate these supersonic-airliner ideas into reality. While others are locking up manpower and money in the development of the next generation of subsonic jet transports, large and medium, Lockheed appear to be making sure that they are the first to move into the supersonic generation. It is certainly going to leave a lot of people rather out of breath.

Mr. Hibbard rounded off our talk in his characteristically enthusiastic way. "People are going to go wild about turbine travel," he said. He would always remember with delight the flight he had with Mrs. Hibbard in a Comet between Rome and London, and he always loved riding in the Viscount. "I predict that traffic, which has gone up in the past by 15 or 17 per cent a year, will go way up in the next few years."

Warren next took me in his car down the road to the Electra production drawing office, which I found comparable in size to the big D.O. at Weybridge, or to one of the floors of the new design block at Hatfield without its partitions. I gathered that 95 per cent of Electra production drawings had been checked and released to the shops, and that most of the remaining five per cent had been released but were not yet checked. This was a deliberate policy aimed at speeding up production: only rarely did the check result in extensive tool mods, I was told, and the chances were that none at all would be needed—by which time production metal would be being cut.

I learnt here that, in addition to the systems rigs, there were four Electra mock-ups: (1) metal fuselage, compressed in length, for testing cabin heat insulation; (2) similar acoustical mock-up, not interchangeable with above, for testing cabin sound insulation; (3) wooden "sales" mock-up for interior layouts only; and (4) elaborate metal and wood mock up for the routeing (pronounced "rowting") of systems, installation of components, and fitting together of structure (see later).

Here I met Hugh McGlasson, special assignments engineer, who looked after our Arthur Bowbeer last May when he was drawing the Electra. Apparently "Art" had become quite a permanent fixture around the place while doing his Electra and 1649A cutaways for the July 6 issue of *Flight*. I was pleased to hear from Hugh McGlasson that he found that issue a useful reference to "the way other people do things," though I felt sure that the other people would be just as interested in the way *he* did things on the Electra.

## Lockheed's "Staff System"

Warren, indefatigable despite his bad arthritis that day ("It always happens when *Flight* comes"), had one more person for me to see—someone I wanted to meet very much. This was John MacDonald, an Englishman who moved from B.O.A.C. to Lockheed five years ago, and who is now the firm's senior staff engineer in charge of airline maintenance design. (There are, I believe, about 65 British engineers employed at Lockheed Burbank). John explained to me how his department, which consists of a dozen or more experienced ex-airline men, fitted into the general Lockheed design scheme. I learnt two things from him: (1) that Lockheed appear to have a sensible way of launching their new projects, and (2) that it will not be by chance if the Electra escapes the criticism of that cynical gentleman the airline maintenance engineer.

It appears that someone at Lockheed realized a few years ago that with so many projects on hand too many engineers were getting tied up in too much detail. ("You invent so many aircraft," John said, "you can't even remember their numbers.") The "staff system" was evolved whereby the cream of the firm's best engineers was skimmed off and so organized that these men, all highly paid, could concentrate on the "broad brushwork" (the rank and file engineers prefer to call it "cartoon drawing") and also—most important this—keep their ears to the ground of the outside world.

John MacDonald's team of ex-airline engineers is a part of the staff system, and is devoted to ensuring that good maintenance qualities are a basic and not a secondary part of transport designs. In his office is a chart entitled "Maintenance Design Principles" which lists the following *desiderata:* Simplicity, reliability, accessibility, serviceability, interchangeability, safety. On his desk happened to be a new type of fuel coupling. I asked whether *every* such item was evaluated according to the principles on the chart. The answer was yes.

My time was now fast running out, and I had not yet seen anything of the Burbank factory. Poor Warren's arthritis was by now so bad that a lightning tour of the plant was out of the question for him. So he handed me over to his colleague Dick Bean, who although very busy with other things dropped them all to show me round Super Constellation production.

My impressions are perhaps best recorded from the rough jottings I made in my notebook (unedited original available for inspection) as Dick shepherded me from one department to another of his firm's gigantic plant. *"Too much for eye to take in. Same sounds, cellulose smell, clatter of rivet guns. Bluish skin protection, thinner and more difficult to peel off. Notices: 'What Are* You *Doing About Materiel Conservation?' Extensive use of docks for fuselage assembly—mating docks for fuselage rings, noses, triple tails, and pressure-test docks before fuselage towed outside and across runway to final assembly. Point out biggest hydraulic press (8,000 tons) in the aviation business, 10ft × 30ft. Think of subcontracting as well—all this stamping, milling, pressing, miles of it, just for Connies and P2Vs, although half that aeroplane subcontracted. Battery of electronic computers (IBM) for technical offices. Christmas trees in every department. 1049H at the end of the line with Eastern markings but Seaboard and Western tail. Not production error, aeroplane was leased to Eastern half-way through painting. Drab matt-grey WV-2 early-warner. Impressive towering height of Connies on the line. Super Connies all spilled out of factory to floodlit outside—three Air France, lots of early-warners, R7V turboprops, first T.W.A. 1649A nearing flight test. . . ."*

The finale was a visit to the mock-up department. I had been told about the engineering mock-up (no. 4 on the list recounted earlier), but I confess I was not expecting to see anything quite so elaborate. It is more an aeroplane than a mock-up, in appearance rather like a *Flight* cutaway drawing. The metal structure of the fuselage and port wing with nacelles (but no engines) is complete, with skin panels containing window cut-outs in place. (The starboard wing was the stub only.) All hydraulics, electrics, fuel lines and control runs appeared to be installed, and a good deal of equipment—from airstairs to radio—was apparent also.

Standing back to appraise it from a distance my main impressions were: (1) that the Electra is quite strikingly smaller than the Vanguard, the mock-up of which I had inspected at Weybridge a week or two before; and (2) that it will be a very good-looking aeroplane.

I next looked inside the adjoining all-wooden "sales mock-up" to inspect the American Airlines "living room look." We shall give our impressions of this on our Civil Aviation pages next week.

Dick and I rounded off my day at Lockheed by stopping at a "Dial-A-Cup" machine in the factory. Dick put in two dimes and a nickel, and I dialled myself a black coffee, without sugar and without cream. There were also other machines on which, had I wished, I could have dialled myself some Fresh Gum or some Fresh Doughnuts. There was, I thought, nothing in British factories to equal that.

*(In Part 2 next week the author will describe his day with Douglas.)*

***The "living room" interior of the American Airlines Electra, of which the author will record his impressions on our Civil Aviation page next week.***

*Left to right: Mr. George Edwards (Kt. Bachelor), Mr. F. J. Pascoe (Kt. Bachelor), Sir Maurice Dean (K.C.B.), Mr. G. F. Stedman (K.B.E.), Mr. O. W. Humphreys (C.B.E.), Mr. James Martin (C.B.E.), Sir John d'Albiac (K.C.V.O.).*

# The New Year Honours

LAST week we briefly recorded some names of aviation personalities appearing in the New Year Honours List; here it is possible to give a more detailed list, together with a number of portraits. Honours in the military divisions of the various orders, insofar as they affect Royal Air Force personnel, are listed on page 61 of this issue.

### KNIGHTS BACHELOR

G. R. Edwards, managing director, aircraft division, Vickers-Armstrongs, Ltd.; F. G. C. Fison, chairman, Fison's Peat Control, Ltd.; F. J. Pascoe, chairman and managing director, British Timken, Ltd.

### ORDER OF THE BATH

**K.C.B.**

Sir Maurice J. Dean, Permanent Under-Secretary of State, Air Ministry.

**C.B.**

L. J. Dunnett, Deputy Secretary, Ministry of Supply; V. A. G. Lambert, Director-General of Armaments Production, Ministry of Supply.

### ORDER OF THE BRITISH EMPIRE

**K.B.E.**

G. F. Stedman, Deputy Secretary, Ministry of Transport and Civil Aviation.

**C.B.E.**

Capt. G. U. Allan, assistant general manager, Qantas Empire Airways; W. G. MacD. Anderson, Director of Works, Air Ministry; O. W. Humphreys, director, G.E.C. research laboratories; P. Lloyd, Deputy Director, Research and Development, National Gas Turbine Establishment, Farnborough; A. E. Manning, Assistant Secretary, Ministry of Transport and Civil Aviation; J. Martin, managing director and chief designer, Martin-Baker Aircraft Co., Ltd.; W. N. Robinson, Assistant Secretary, Ministry of Supply; J. Salmon, Honorary Catering Adviser, R.A.F.; E. J. Sturgess, chief engineer, Shell Petroleum Co.; Lt-Cdr. J. W. Thornycroft, R.N. (Retd.), managing director, John I. Thornycroft and Co., Ltd.

**O.B.E.**

F. E. Ball, principal scientific officer, Ministry of Supply; G. C. Brown, principal, Air Ministry; A. W. Clarke, principal, Ministry of Transport and Civil Aviation; S/L. C. J. Collins (Retd.), secretary, R.A.F. Small Arms Association; E. J. Connellan, governing director, Connellan Airways, Ltd. (for services to civil aviation in North and Central Australia); D. P. Davies, chief test pilot, Air Registration Board; Rev. Canon I. E. Eastwood, officiating chaplain to the R.A.F., Middle Wallop; G. Grey, managing director, Adhesive Tapes, Ltd.

E. G. James, leader of valve group, G.E.C. research laboratories, Ltd., Wembley; H. Lager, lately chief executive officer, Air Ministry; A. Mathisen, managing director, Graviner Manufacturing Co., Ltd.; C. V. Ockenden, senior principal scientific officer, Meteorological Office, Air Ministry; R. D. Peggs, principal, Royal Aircraft Establishment Technical College, Ministry of Supply; A. J. Penn, chief engineer, Aero Gas Turbine Division, D. Napier and Son, Ltd.

Obs. Capt. W. Rusby, Deputy Commandant, Royal Observer Corps; G. Simpson (for services to the Royal Flying Doctor Service of Australia); Lt-Col. R. D. Simpson (Retd.), chairman, Cumberland and Westmorland Wing, Air Training Corps; G/C. R. G. Slade, chief test pilot, Fairey Aviation Co., Ltd.; C. A. M. Kyrke-Smith, chief air traffic control officer, Ministry of Transport and Civil Aviation.

**M.B.E.**

J. N. Andrews, Director of Finance (Treasury), Australian Department of Air; H. C. Becker, superintendent, Commonwealth Aircraft Corporation Pty., Ltd. (for services to the aircraft industry in Australia); Capt. E. J. E. Burt, senior captain, 1st class, Argonaut fleet, B.O.A.C.; F. J. Christie, higher executive officer, Air Ministry; A. E. Coe, senior experimental officer, Ministry of Supply; B. F. Collins, airport commandant, Southend Municipal Airport; W. C. Cropper, group leader, research laboratories, G.E.C., Ltd.

W. Drakeford, works manager, Armstrong Siddeley (Brockworth), Ltd.; A. A. Elliott, higher executive officer, Ministry of Transport and Civil Aviation; B. Fullman, chief information officer, British Non-Ferrous Metals Research Association; A. H. Gay, lately senior executive officer, Nottingham, Ministry of Supply; Capt. E. J. Hassard, commercial pilot, Australian National Airways Pty., Ltd.; A. Hughes, higher executive officer, No. 7 Maintenance Unit, R.A.F. Quedgeley, Glos; W. F. Jaggs, higher executive officer, Air Ministry; S. S. Jones, acting aeronautical engineer, Australian Department of Air; A. W. Kieft, chairman of committee, No. 215 (Swansea) Sqn., Air Training Corps.

F. E. B. Long, welfare officer, staff department, Shell-Mex and B.P., Ltd.; A. R. Mellor, chairman of committee, No. 1024 (E. Wight) Sqn., Air Training Corps; E. A. Middleditch, general production manager, de Havilland Aircraft Co., Ltd., Chester works; B. A. Morris, senior investigating officer, civil aviation accidents investigation branch, Ministry of Transport and Civil Aviation; H. N. Murray, cargo service manager, B.E.A.; J. Phillips, chief training officer, organization and service division, Ministry of Transport and Civil Aviation; W. E. Pryor, senior experimental officer, Air Ministry.

H. G. Rivett, senior executive officer, Air Ministry; A. W. Southerton, inspector, Royal Aircraft Establishment, Farnborough, Ministry of Supply; H. Starr, signals officer, Civil Aviation Telecommunications Directorate, Ministry of Transport and Civil Aviation; W. W. Syrett, export manager, E. K. Cole (Radio Division), Ltd., London; A. J. C. Tatt, higher executive officer, Ministry of Supply; Miss D. M. Thompson, chief welfare officer, Air Ministry; E. A. B. Tooth, clerical officer, Air Ministry; Miss M. K. Walshaw, private secretary, Thos. Firth and John Brown, Ltd.; D. B. Webbe, mechanical and electrical engineer, Air Ministry.

*Mr. D. P. Davies, Mr. A. Mathisen (O.B.E.s).*

### ROYAL VICTORIAN ORDER

**K.C.V.O.**

Air Marshal Sir John D'Albiac.

**C.V.O.**

G/C. J. E. Grindon, R.A.F.

**M.V.O. (FOURTH CLASS)**

F/L. G. C. McCarthy, R.A.F.

### BRITISH EMPIRE MEDAL

F. Ansley, principal foreman of stores, No. 7 Maintenance Unit, R.A.F. Quedgeley; J. E. Downing, chargehand inspector, Ferranti, Ltd.; S. E. Elliott, foreman of trades, No. 72 Maintenance Unit, R.A.F. Roade; F. W. Gosney, skilled aircraft fitter, Blackburn and General Aircraft, Ltd.; F. Green, head servant, R.A.F. College, Cranwell; T. Hakley, chargehand (tool and model maker), Royal Aircraft Establishment, Ministry of Supply; J. Jacs, horizontal borer operator, Rolls-Royce, Ltd., Glasgow; P. D. Niekirk, chief observer, Post 5 A.4, No. 5 Group, Royal Observer Corps; G. T. Pearce, research and development craftsman, Royal Aircraft Establishment; G. W. Rockliffe, chief observer, No. 20 Group O.R., Royal Observer Corps; A. W. Rowley, foreman, G.E.C., Ltd., Wembley; W. G. Turner, supervising instructor grade I, R.A.F. Technical College, Henlow.

### QUEEN'S COMMENDATIONS FOR VALUABLE SERVICE IN THE AIR

Capt. R. E. Millichap, fleet superintendent, Constellation fleet, B.O.A.C.; Capt. W. R. Mitchell, senior captain, first class, B.E.A.; Capt. F. W. Walton, officer in charge of training, Britannia fleet, B.O.A.C.

### ROYAL VICTORIAN MEDAL

**SILVER**

F/Sgt. A. Hart, R.A.F.; Sgt. A. E. Horn, R.A.F.

*Left to right: Mr. A. J. Penn and G/C. R. G. Slade (O.B.E.s); Capt. E. J. E. Burt, Mr. W. Drakeford, Mr. E. A. Middleditch (M.B.E.s); Capt. R. E. Millichap and Capt. F. W. Walton (Queen's Commendation).*

# Research, Development and Technical Issues

## *The 1956 Wright Brothers Lecture by Sir Arnold Hall—Part 3*

**IN the two preceding issues we have published the first and second parts of the Wright Brothers Lecture delivered recently by Sir Arnold Hall, F.R.S., M.A., F.R.Ae.S., before the Institute of the Aeronautical Sciences in Washington; here we print a third and final instalment. The illustrations have been re-drawn from those accompanying the paper, which is reprinted almost in full. Sir Arnold Hall is technical director of the Hawker Siddeley Group.**

I NOW return to the question I left earlier, which was whether the high-subsonic aeroplane merited long term attention to reduction in cost. The answer is "yes," since the other régimes now opening up do not offer the high-subsonic aircraft such competition that a large part of the market can be expected to turn to them, anyway for a long time. The jet-propelled, high-subsonic aeroplane is an ideal tool of medium-to-long-range civil aviation—or will become so when the ancillary services, such as traffic control, match it, as they undoubtedly can. I would like to discuss for a moment the two ways mentioned previously by which greater economy could be sought in this class of aircraft.

The influence of size is not apparent from the range equation because it comes from a greater economy of weight in the design; but there is little doubt that an aeroplane flying at Mach number 0.87 and weighing 450,000 lb, as compared with the next generation's size of nearly 300,000 lb, would show an effective reduction in the cost of the seat-mile. But there is a clash between ultimate economy and the service the passenger expects. It is roughly the case that settled transport systems provide a frequency of service comparable with the travelling time—a not unnatural situation, since it would be odd to have to wait an hour to make a five minute journey, or equally to have daily departures for a sea journey of four weeks. In Fig. 14 is a diagram, due to Sir Arthur Gouge (and reproduced with permission from the *Journal of the Royal Aeronautical Society*), showing the way in which transport systems of different types fall into the pattern of "time between departures roughly equal to journey time." The subsonic aeroplane, by greatly decreasing the journey time, will generate a demand for higher frequency, and this, on a given size of market, must delay the need for greater size in aircraft with the economy that it brings. Nevertheless, because the market for civil aviation will increase so much in coming years, still bigger jet-propelled aircraft are by no means unlikely to be developed, but I think this will not happen until frequency has first been increased over present figures. There is another factor which may influence adversely the possibility of gaining further economy by increase of size, and that is the noise generated by the aircraft. Noise is, of course, related to the power installed in the machine and a bigger machine will also be noisier; this point is discussed in a later section.

The high-by-pass-ratio ducted-fan seems, in many ways, the ideal power plant for these high-subsonic aircraft, if its promise can be achieved in practice. Fig. 15 shows the relationship between all-up weight and payload for a 500-knot trans-Atlantic aeroplane powered with simple-jet engines and with ducted-fans. (This takes account of the higher specific weight of the fan.) I think the reason that a ducted-fan is not available is not because these arguments are invalid but because the main sweep of jet engine development has hitherto been pressed forward by the needs of fighters, where cruising fuel economy is by no means the sole criterion for success. But in addition to this, as mentioned in the discussion of specific fuel consumption, the ducted-fan is an engine that has a narrow field of dominance; below Mach number 0.8

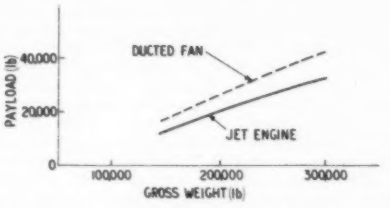



*Fig. 15. Ducted fan and turbojet propulsion for high-subsonic airliners. The aircraft all have a still-air range of 5,500 n.m. at M=0.83 and are designed to a uniform severe runway requirement. The latter accounts for differences between the curves and data published for existing or projected designs.*

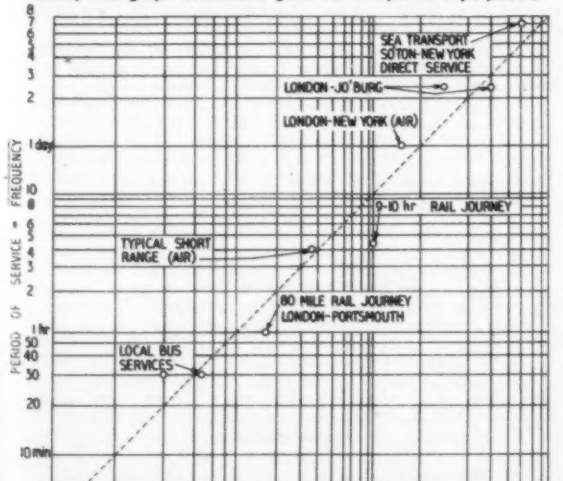
it is defeated by the propeller-turbine, and above Mach number 1 it is defeated by the simple-jet engine. It happens that the region of the fan's dominance is that at which long-range civil aviation finds its best economy, and at which it is likely to play a large part for many years in providing travellers with service. The arguments of the past which condemned the ducted-fan on grounds of lack of flexibility for application over a wide speed range were valid as they were put, but perhaps did not take account of the fact that an important section of aviation will operate in conditions in which the fan has much to offer.

**Life of Aircraft Structures.** The only structural topic I want to discuss, apart from the generalizations contained in previous sections, is the question of the strength of aircraft, such as those that must have a very long working life for civil use, or military aircraft which are especially subjected to fluctuating loads when used, for example, for ground attack. I think two matters have become particularly controversial: first, should structural design be based on the philosophy of "guaranteed life within which structural failure will not occur" or on the philosophy of "if it fails, it does not cause immediate catastrophe"? (these are the so-called "safe life" and "fail safe" policies); second, is the use of a fatigue test on the complete aircraft justified? Since I and my then-colleagues at the Royal Aircraft Establishment used a complete aircraft fatigue test for a particular accident investigation, such a test has become mandatory in British civil airworthiness requirements. This has been a subject of much discussion, as has also the question of whether the particular form of test we used (the "tank test") is the best way to do the work—assuming it has to be done. I am grateful to my late colleagues, Dr. P. B. Walker and Mr. Atkinson, of the R.A.E., for discussions which have helped me to clear my mind on these points.

The "safe life" approach may be defined as the determination of the length of service that an aircraft structure—or part of it—can endure without failure in fatigue. When the safe life of any part is reached, the part concerned is to be replaced by a new one. If this is impossible the aircraft has reached the end of its useful life and must be withdrawn from service.

The "fail safe" approach permits failures in the primary structure provided the failure is certain to be found by inspection before the strength is reduced below specified standards. The implicit assumptions in this approach are that the "fail safe" characteristic can be established, and that reduced static strength of the structure can be accepted. The suggestion that a reduced standard of strength can be accepted for the period between the occurrence of a failure and its detection and rectification raises the question of how the reduced standards are to be arrived at. This is a matter which has been under serious official consideration recently in U.S.A. and in England, and I will not intrude on the discussion in detail. But whatever arguments on probability

*Fig. 14. General transport problem: journey time related to frequency of service. (Though originally drawn to illustrate a much earlier lecture, this graph still holds good for comparative purposes.)*


SEA TRANSPORT SOTON-NEW YORK DIRECT SERVICE
LONDON-JO'BURG
LONDON-NEW YORK (AIR)
9-10 hr RAIL JOURNEY
TYPICAL SHORT RANGE (AIR)
80 MILE RAIL JOURNEY LONDON-PORTSMOUTH
LOCAL BUS SERVICES
PERIOD OF SERVICE = FREQUENCY
1 day
1 hr
10 min
10min 20 30 40 1hr 2 3 4 5 6 8 10 1day 2 3 4 5 6 7 8
JOURNEY TIME

of failure during the vital period are raised, I doubt if one can come below a strength such that the pilot can safely apply at any time a manœuvre of reasonable severity, since otherwise the confidence of the crew and passengers in the ruggedness of the aircraft must be in doubt, anyway, throughout its later life. The definition of "reasonable severity" is the difficulty.

If a reduced standard of strength is acceptable later in the life of the aircraft, were the original standards too high? The standards specified in the past have, on the whole, resulted in satisfactory service experience and it would, I think, need substantial arguments to reduce them. These arguments might be provided as greater attention is paid to anti-fatigue design and fatigue strength, since an element in the specification of static strength is an endeavour to cover fatigue requirements in the broad. At present, design tensile stresses in civil aircraft are perhaps more governed by considerations of fatigue than of static strength; as anti-fatigue design improves, or as materials with lower static strength but better fatigue properties are used (as some designers advocate), the whole question of static strength requirements will need further review.

The use to which the aircraft is to be put must determine which design approach to adopt—this matter is to be seen not as a "fight to the death" between "safe life" and "fail safe," and it is not a good service to aviation to seek to make it so. For example, for smaller aircraft for use in "out back" areas with limited maintenance and inspection facilities, there is good reason for using the "safe life" approach; the operator is put in the straightforward position that he changes parts at a stated time and the single spar construction may well give him the more economic aircraft. For aircraft taking a heavy beating in continuous low altitude use, the overall economy throughout the aircraft's working life may best be met by "safe life," the cost of the new components being offset by the inspection and repair costs into which the "fail safe" design may run in its later life.

For larger aircraft used for the most part in the high-altitude cruise condition, and worked by operators with excellent inspection and maintenance facilities, both approaches are perfectly reasonable and a combination of "safe life" and "fail safe" may well be appropriate. For economy in inspection and maintenance, a reasonably long crack-free service must be attained in a "fail safe" design, even if the crack is not catastrophic, and it is then essential that the cracks can be easily found and the part repaired. In some parts of the structure there may well be difficulties of inspection and maintenance and these parts must be put entirely beyond suspicion by a "safe life" approach.

In the present state of knowledge there must, I think, be a test to confirm that the trouble-free life is not too short; to determine where cracks are to be expected, and their significance; to determine safe lives where necessary; and to develop inspection techniques and procedures that can be relied upon to find the cracks before it is too late. Recent test work in England has shown what one would expect—that it is not where fatigue trouble has been anticipated and designed against that fatigue failures are found, but in local details and particularly in those that cause a rapid diffusion of load; there have been somewhat higher stress concentrations than were estimated. In nearly all our major tests, cracks and failures have been produced at places other than main joints, and they can usually be explained by considering the way in which the load is diffusing in the area. Concentration on the joints alone is not sufficient.

The complete aircraft fatigue test provides knowledge which it is difficult to get with certainty in any other way. A longer operating life can be allowed with safety if test results are available to substantiate the design. The method includes comprehensive strain gauging, and it is usually possible to extend the fatigue life by minor modifications at points of high stress revealed in the tests. In the application of "fail safe" principles the tests produce the cracks and establish their rate of growth; they prove that the alternative stress routes actually exist and that they operate successfully after the crack has formed.

Increases in the life of civil aircraft to 20 years at full utilization is an aim which, if achieved, would make a further impact on the already favourable trend of aviation economics; such achievement will be largely governed by success in design against fatigue, and is therefore dependent on the acquisition of the detailed knowledge which only testing can provide. The more fatigue testing is done, the more it seems to be justified.

We have not found anything better than the water tank test. No difference has been detected between tests done under water and those done in air. There are, of course, uncertainties in the correspondence between a tank test and service use, but I doubt if they are serious and further experience will shed more light on them. It is, it is true, difficult to represent the effects of maintenance and factors, such as corrosion, that are time-dependent. Some commentators have been concerned as to whether corrosion taking place in the tank may not produce a serious adverse effect on the fatigue life of the specimen; this is not so, for less corrosion takes place in the tank than occurs to the aircraft in service as a result of flying or standing in the rain. The question is whether the tank over-estimates the life, rather than under-estimates it on this score.

The broad indication from work in England is that from the fatigue standpoint the cabin is an easier design problem than the wing. On the other hand, the cabin is more vulnerable to danger from external sources, and therefore the form of construction adopted and the stress levels used should have this very important consideration in view. As for tailplanes, our experience has been good; the structure is usually relatively simple and straightforward, and it may also be that designers tend to be more conservative with the tail. But undercarriages are items which require careful attention. The tendency is to design the oleo to have a low value of the reaction coefficient, and this means that if the undercarriage is designed under considerations of static strength, then a relatively large fraction of the ultimate load is applied on every landing. The use of large light-alloy forgings gives this particular point; unless the design and heat treatment of the forging is suitable, large "locked-in" stresses can be caused, and lead, in conjunction with the landing load, to early fatigue failure. Our experience has led us to the following principles in handling large forgings; these have helped to achieve success in voiding serious "locked-in" stresses. The forgings should be quenched in boiling water and the alloy used should be such that it suffers only minor loss of mechanical properties as a result of this treatment. The forging should be heat-treated in the fully-machined condition whenever possible. Where the dimensional control obtainable in a boiling water quench is not good enough, a very small amount of post-heat-treated machining is allowable, provided it is symmetrically disposed.

Before leaving the subject of fatigue it is interesting to note that the problem of the rate of growth of cracks, which is vital to the "fail safe" approach to design, is an example of an almost forgotten research. In 1921, Dr. A. A. Griffith put forward an analysis of the propagation of cracks in brittle materials and advanced the hypothesis, which he was able to support by experimental evidence, that rapid propagation of the crack takes place if the rate of work done by the release of strain energy in the material exceeds the rate of energy demanded to produce crack extension. This research was apparently forgotten, except perhaps by specialists, and was not connected by engineers with the problem of crack propagation in ductile materials used for structures; indeed, it is probably fair to say that until an aircraft accident brought the question of crack propagation into strong prominence, most engineers had not studied the question seriously at all, though some steel structural designers had encountered and considered the problem of "brittle fracture" particularly in such structures as oil-storage tanks.

Recent work has shown, as would be expected, that the original Griffith theory does not apply to ductile materials, probably because the energy absorbed in the plastic phase of deformation of a ductile material must be taken into account. However, although attempts to evaluate the rate of work required to create new cracked surface, using present theories, give disappointing results, a great deal of empirical data is now accumulating. It appears from present work that the relationship between stress, and the length of crack which is critical in the sense that it will run rapidly, is affected by the width of the plate and to some extent of its thickness, but not by its length. The relation is unaffected by cyclic loading, or pre-straining, but is greatly influenced by the presence of reinforcing.

In Fig. 16 are shown some typical results on the influence of crack-stopping reinforcement, for which I am indebted to the Bristol Aeroplane Company. An artificial crack was made in the

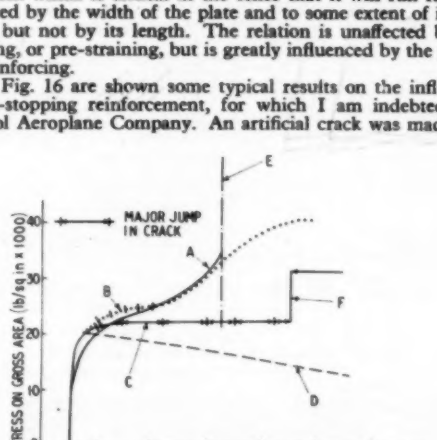



*Fig. 16. Test on specimens in 0.028in plate with crack-stoppers: A, integral stopper; B, Reduxed stopper; C, riveted stopper; D, fast-cracking threshold for unreinforced plate; E, inner edge of stopper; F, inner rivet line.*

plate, to which stress was then applied. The graph shows how the crack grew under additional stress. Rapid growth starts in each case at about the threshold for an unreinforced plate; this suggests that the condition for the start of self-propagation is local in character and is uninfluenced by the presence of the stoppers. Thereafter, rapid growth took place in the specimen using a riveting stopper, until it was arrested at the inner rivet-line; the specimen then took a higher stress until it failed. When the stoppers were attached by an adhesive (Redux) the growth was slower; when the stopper was machined integrally with the plate, the growth was also slower but failure took place earlier than in the Reduxed specimen, occurring when the crack reached the fillet on the stopper.

With the accumulation of empirical data of this kind, it is likely that before long the mechanism of cracking and tear resistance will be much more understood, and "fail safe" design will become firmly based.

**Noise from Aviation.** The noise on the ground from aircraft in the air is not unnaturally becoming a considerable issue in public affairs. It is sharpened as an issue by the fact that, at present anyway, the people on whom the noise descends are, for the most part, not the people who enjoy the benefits of aviation. I think that there is no doubt that those who do enjoy its benefits must be willing to pay a little more in order to reduce the impact on those who do not. In this section I want to discuss, in the broad only, what has caused noise to emerge more importantly and what the cost to the traveller will be to keep it in bounds. I am indebted to Mr. Greatrex of the Rolls-Royce Company for discussions on this matter that have cleared my own mind and I have quoted figures from a recent paper on the subject written by Mr. Greatrex.

First, it is important to realize that the size and cruising speed of an aircraft controls the noise it makes, because this is related to the power of its engines. A large part of the present day worry about noise is caused by the fact that aircraft are larger than they used to be. There will, of course, be detailed differences in design between aircraft which will affect comparison of the noise they make, but in the broad it is inevitable that an increase of weight from 30,000 lb to 300,000 lb will involve an increase of noise of about 10 decibels. This is a factor which has some bearing on whether aircraft will get bigger, and therefore more economical, as discussed in a previous section, though it is an open question whether a louder noise less often would be preferable to a lesser noise at higher repetition rate. It will also have a bearing on whether jet-elevated vertical take-off aircraft could be used for city-centre operation; they have an installed-thrust which exceeds their weight and must be very noisy.

Then there is the influence of the introduction of jet propulsion; the character of the noise from a jet engine is different from that due to a propeller engine. In a propeller-driven machine, the propeller itself is a major source of noise; this is added to by the engine exhaust to an extent that depends on the type of engine and on its installation.

Making allowance for increase of size and cruising speed, on a pessimistic basis future jet-engined aircraft of the 300,000 lb class, without provision for noise suppression, will be about 18 decibels noisier than quiet present-day pistoned types, and 8 decibels noisier than noisy present-day types. We are now confident in England that we can more than bridge the gap between the large jet transport and present-day noisy types. The use of a by-pass engine, which gives a lower jet velocity than the simple-jet, for the same thrust, drops noise by about 3.5 decibels. In passing, the use of a ducted fan would drop it much further. Next, means have been found by the use of a development of a corrugated nozzle to produce a further reduction of about 7.5 decibels, giving a combined reduction of 11 decibels. This will make the future large jet quieter than present noisy piston types, though still rather louder than present quiet piston types. To produce this effect the nozzle must be very corrugated indeed: relatively minor corrugations have a much smaller effect.

Jet engines need thrust reversers and it is therefore desirable that the jet pipe should incorporate a noise-supressing nozzle and a thrust reverser. Successful designs have been evolved incorporating both, but these are not, of course, without their cost. It is difficult to separate penalties resulting from each of these two items, but dealing with the noise suppression alone, and taking together the effects of loss of cruising thrust, the drag of the installation and the weight penalty, it emerges that the overall result on a large long-range jet aircraft is equivalent to an increase in cruising specific fuel consumption of about 2 per cent. If take-off length is critical, the effect of loss of take-off thrust might be equivalent to another 1 per cent increase in specific fuel consumption. The increase in the cost of the seat-mile will depend on the flight plan; but in very round figures the passenger will pay about 6 per cent more on internal routes and 9 per cent more on trans-Atlantic routes than the fare the aircraft could otherwise offer, in order to relieve the people on the ground.

The field remains a fruitful one for research. We have by no means a full understanding yet of the way in which corrugated nozzles produce their effect, though there are some theories in outline.

**Conclusion.** I have not set out in this lecture to reach, or to advocate, any particular conclusion. But in writing about aeronautical research and development, and on some of the technical factors which will influence the next phase of aviation, it is difficult to resist the temptation to think in broader terms of what aviation has done and will do. The world has needed aviation, and has set out to get it, to an extent that has caused it to be above most other things the mainspring under which the methods of organized research have developed; these methods are now rapidly spreading throughout other technologies. But the reason aviation has been so much sought after—and will continue to be so—is that it has exerted a greater influence in a shorter time over a wider area of politics and sociology than most other developments, and its powers in this respect are still nearer their beginning than their end.

Mobility of people and of heavy goods has had as great an effect on the broad trend of world affairs as most other factors. Political integration has been greatly influenced by it, because it is the capability of moving men and material with reasonable dispatch to the limits of a political area that gives point to the rule of whatever law applies within it. Internal transport and internal communication systems have set a limit to what it was reasonable to attempt to govern, and it has generally been the case that when that limit was exceeded the outlying districts did not for long—in historical terms—stay within the orbit. By providing a method of movement at much greater speed, with a by-no-means negligible capacity for quantity, and with greater indifference to geographical features than most other systems, aviation has already had a decisive influence on world affairs and will in future exert an even greater one.

In recent years civil aviation has matured and is in sight of having tools for its job which are excellently suited to it; that this is so will become quite clear when the ancillary services on the ground have been adapted, as they can and must be, to meet the needs of the new aircraft. Civil aviation has before it an enormous expansion; this will come from a pursuit of economy in the cost of the seat-mile, which will succeed, and which will open up air travel to a far wider cross-section of the world's population than use it now. Civil aviation has expanded in recent years at a rate which exceeds that achieved by most other industrial enterprises at a comparable stage in their development; on airlines operating in the Western World, two million passengers were carried in 1937, and over fifty million in 1953. Air freighting has also shown a considerable expansion; there was a tenfold increase in freight ton-miles carried by Western World scheduled operators between 1946 and 1955, and this has been done largely with adapted aircraft rather than with machines particularly designed for the purpose. Freight will follow the passenger trend—it will go faster and be turbine-propelled—and it is likely that the market will respond to the increasing availability of machines particularly suited to its purpose.

In the military field aviation's first major influence was to restore to land battles the mobility that they had lost, and so to alter radically the character of land war. Land battles had become static in the first world war because it took a long time to concentrate for an attempt at a break-through, and during this time the other side, becoming aware of the build-up of strength before it, were able to group to meet the attack when it came. Tactical aviation changed this; improvement on ground transport permitted more rapid concentration, while, if air superiority had been attained, interference from the air frustrated counter-grouping. This was the major effect of aviation on the second world war. But, throughout the development of long-range aviation, the concept of dominance by the bomber being decisive in itself had been canvassed.

This latter possibility was not in fact in sight until the development of atomic explosive which, by providing a vast increase of hitting power at a moderate weight, permitted the design of aircraft for its delivery having far longer ranges than those previously used for bombing. This has made possible the policy of the "nuclear deterrent"; it has also made a radical change in the distribution of the air threat. The political reaction of countries to world situations are inevitably governed by the direct threat to their homeland and one of the big influences which aviation will have on world affairs in the next decade will arise from the fact that the U.S.A. has joined the other major Powers in being under a heavy direct aerial threat.

The extent to which the political effects arising from this will be moderated by technical advance in air defence remains to be seen. The nuclear bomb, by multiplying something like a million times the explosive power that can be delivered by a single aeroplane, has relieved the offensive of restraint in range, in end-point accuracy and in sensitivity to losses, and defence has therefore a large burden to overcome if it is to be of account. This burden is made the heavier by the fact that defence depends vitally

on electronic techniques which are, to a greater or lesser degree, vulnerable to electronic interference. Improvements of a few per cent, or even hundreds of per cent, makes little impact on a million-fold advantage. Much has been made in public debate of the high-explosive ground-to-air guided weapon as an antidote to this position, but it is difficult to feel happy with the argument. There are available to such weapons, in principle, no devices of a special kind for ensuring end-point accuracy or lethality that are not available to fighter aircraft, and the choice of whether or not to replace the pilot by automatic devices should be seen as one of many technical decisions involved in creating a weapon rather than, as seems to have been the case with some commentators, an issue in itself. As an issue it is a relatively minor one from the technical point of view. The overriding factor is the million-fold increase in offensive power. This will, no doubt, eventually be offset by the use of nuclear explosive for air defence and such a development may well make a more powerful impact on the dominance of the bomber and ballistic missile, and hence on the political results that stem from that dominance, than any other single factor. While these consequences of developments in long-range aviation are going on, the initial impact of military aviation on the land battle will not have diminished in importance; indeed, the more successful the policy of the global deterrent becomes, the less likely it is to be employed, and the more likely does it become that means will be sought to "get around the flank."

In a world which must increasingly recognise the interdependence of countries' vital interests, and realise that advance in the standard of living for all is best achieved by ensuring that the contribution that each can offer, whether in terms of special goods or of special facilities, is available to others, transport aviation for people and for goods will have a decisive contribution to make. The military side of aviation is an essential guard for stability; the civil side an important means of exploiting this stability for the common good.

## APPENDIX

(*see page 19, Part 2*)

**The Range and Economy Equations.** The general performance of an aircraft that spends a large part of its flight in a cruising condition in the stratosphere is contained in the equation

$$R = \left(\frac{L}{D}\right)\left(\frac{V}{c}\right) \log_e \frac{W_O}{W_{LF}}$$

where $R$ = gross cruising still-air range.

$\left(\frac{L}{D}\right)$ = lift/drag ratio in the cruise.

$V$ = cruising speed.

$c$ = specific fuel consumption of the engines.

$W_O$ = total weight at the start of the cruise.

$W_{LF}$ = weight of the aircraft less its fuel.

This equation applies to any type of propulsion, if the powerplant performance is converted to an equivalent specific fuel consumption, and to any configuration of aircraft, provided it flies at constant lift/drag ratio.

Defining the "operational fixed weight equipment" as the sum of the earning payload, the crew, and the equipment of fixed weight necessary for the conduct of the mission, the weight-less-fuel ($W_{LF}$) of the aircraft is the sum of the weights of the "operational fixed weight equipment" and the weight of those items that are dependent on aircraft size, such as structure, powerplant, and systems. The range formula thus relates these weights by the expression

$$\frac{W_C}{W_O} + \frac{W_B}{W_O} = e^{-\frac{Rc}{V(L/D)}}$$

where $W_C$ = weight of the operational fixed weight equipment.

$W_B$ = basic weight = $W_S + W_P + W_M$

$W_S$, $W_P$, and $W_M$ are the structure weight, the powerplant weight and the miscellaneous systems weight respectively.

$\frac{W_C}{W_O}$ can be loosely described as the fractional payload. The "earning" payload is less than $W_C$ by the weight of the crew and fittings for the mission.

The data contained in this equation can be plotted in the form shown in Fig. 6 where $\frac{R_C}{V}$, $L/D$, $\frac{W_B}{W_O}$ and $\frac{W_C}{W_O}$ are related. The range needed ($R$), the speed proposed ($V$) and the specific consumption (c) available, fix $\frac{R_C}{V}$, which is then related to the line marked with the $L/D$ expected, on the left hand plot; horizontal transfer to the right hand plot then produces the relation between $\frac{W_B}{W_O}$ and $\frac{W_C}{W_O}$.

A rough approximation to the direct operating cost of a long range civil aircraft is given by

$$P = \frac{A}{R}\frac{W_F}{W_e} + \frac{B}{V}\frac{W_B}{W_e}$$

where $P$ = direct cost in money per ton mile.

$A$ and $B$ are constants.

$W_e$ = earning payload, which is $W_C$ less an allowance for crew and non-earning fittings.

$W_B$ = basic weight.

The first term covers fuel costs, whilst the second covers such items as depreciation, maintenance and crew salaries, which are roughly related to the basic weight of the aircraft. In most cases of interest, to the accuracy needed for exploratory work $W_e$ is not greatly different from $W_C$, and

$$P = \frac{W_O}{W_C}\left[\frac{A}{R}\left(\frac{W_F}{W_O}\right) + \frac{B}{V}\left(\frac{W_B}{W_O}\right)\right]$$

The weight ratios are obtainable from Fig. 6. Such approximate costing is not, of course, suitable for detailed work but it is good enough to gain an initial impression. (This cost formula is due to Mr. Thorne of the Royal Aircraft Establishment.)

# TRAFFIC CONTROL AT WISLEY AIRFIELD

A SPECIAL air traffic control installation has recently been completed at Wisley, Surrey, by International Aeradio, Ltd. The equipment was fully engineered in the I.A.L. workshops at Southall, Middx, so that installation was completed with a minimum of dislocation to existing services.

In the main control room at Wisley, which is the chief flight test centre of Vickers-Armstrongs (Aircraft), Ltd., the former control desk has been replaced by an I.A.L. twin-position one. Communication on six V.H.F. channels is provided, audio for three being fed to the left-hand desk-panel speaker and the other three to the right hand. Both positions are provided with R/T. control panels.

*The new I.A.L. desk in operation at Wisley, as described above.*

Control of these six channels is also available to two approach-controllers in the radar room using individual R/T. control units, and to a D/F. operator using a transmitter control unit designed to fit into a V.H.F. D/F. console. These three positions are served by three associated loudspeakers in conjunction with a muting unit.

The receiving and amplifying equipment is housed in two 6ft cabinets, with the six receivers in one and the microphone and loudspeaker amplifier equipment in the other, in a room next to the control room. A third cabinet, containing six transmitters, is at the base of the transmitting mast.

On the air-traffic control desk there are also meteorological indicator instruments, and selector panels for the recorder and for traffic-light control. The former allows selection for tape-recording on any channel; the latter controls the two sets of traffic signals on a road crossing the runway.

Wisley handles production and development test-flying of Valiants and Viscounts, and flight trials of the Supermarine N.113 are carried out there. The scale of activity is indicated by the fact that Vickers-Armstrongs (Aircraft), Ltd., employ twenty test pilots, most of them based at Wisley.

# CORRESPONDENCE

*The Editor of "Flight" is not necessarily in agreement with the views expressed by correspondents in these columns; the names and addresses of the writers, not for publication in detail, must in all cases accompany letters.*

## Internal Air Services

IN his article "Air versus Rail" (*Flight*, December 28) "Integrator" has included the potentialities of the helicopter as the future inter-city transport. However, he seems to have neglected the possible use of such aircraft as the Twin Pioneer, which not only cost less than a helicopter but also cost less to operate.

Aircraft with a performance similar to that of the Twin Pioneer could operate from Hendon to the major provincial cities within a radius of 200 nautical miles; similar services could radiate from Birmingham and Manchester.

Admittedly, the landing strips required will have to be larger than those used by helicopters; however, the additional cost might be offset by the 50-knot advantage in cruising speed. In addition, fully flapped-slotted-slatted aircraft with a touch-down speed of 50 knots will be able to operate in the same weather conditions as those contemplated for helicopter operations. Essentially the concept of a slow-landing, reasonably fast 16-20 passenger fixed-wing aircraft service must include the provision of an adequate "private" airways and navigation system, otherwise the project will be as handicapped as the railways are when trying to introduce 75-knot electric trains on to a 150-year-old system without modernizing the signalling or the track layout.

Possibly the principal advantage of adopting fixed-wing aircraft (with landing and take-off characteristics which approach as closely as possible to those of the helicopter without sacrificing too much cruising speed) is the accumulated experience of 50 years of fixed-wing flight, which eliminates 90 per cent of the guesstimation when planning an internal air service. In contrast, the helicopter—except in Belgium and the United States—still appears to be in the experimental stage as far as economical passenger operations are concerned.

Incidentally, "Integrator's" use of knots for railway speeds is most original and might even be the advent of the use of the nautical mile for all forms of transport.

London, N.W.2. L. F. E. COOMBS.

I HAVE read with interest the article by "Integrator" in your issue of December 28. It may be ten years before we have helicopters or other vehicles serving the provincial towns up to 300 miles away; can no improvement on the rail services be expected before then?

Perhaps the history of the London-Manchester air service gives a clue. According to the theory, rail is just as attractive; yet in four years this service has developed until it is carrying 60,000 passengers per year. There is evidence that it would carry more if the aircraft were available—notably if one wants to travel on a busy day at short notice!

The flaw in the argument is that people often do not wish to travel from city centre to city centre. Many can motor as quickly to the airport as they can to the central railway station. Most journeys "there and back in a day" start at home. Crowded car parks, and diminishing use of the airport buses, illustrate that this penny has dropped; it is particularly noticeable at the provincial terminals. The new factories which many wish to visit are outside the city centres, and involve a further motor journey in either case.

The "small reservation" of passengers travelling through London Airport forms about 30 per cent of the traffic.

One of the busiest American routes, New York - Boston, is the same distance as London - Manchester, and is also subject to intense rail competition. Yet 65 per cent of the traffic on this route is point-to-point; about seventy return flights are provided daily.

These points suggest that there is a market awaiting exploitation. An attractive feature is that it is less liable to seasonal fluctuation; the number of passengers during the busiest and slackest months on such routes is in the ratio of 1.7 or 2.0 to 1, against 12 to 1 on a typical "holiday" route.

Unfortunately, such services are barely profitable at present. It may be possible to charge higher fares, as businessmen can usually justify such expenses by results achieved. But a happier solution would be to reduce the cost of the operation.

A higher density of service would reduce the station cost per passenger. A general expansion of activities should reduce costs by spreading an airline's fixed costs. Experience abroad suggests that it might be profitable to provide service to Midland towns by breaking flights to Scotland and Ireland for five to ten minutes. Such flights would act as extras for the direct flights, as well as exploiting the traffic available at the intermediate points. Liverpool, Manchester, Birmingham, Leeds/Bradford, Hull and Newcastle are well placed for this type of operation.

Perhaps staff economies can be achieved, because business passengers are experienced travellers; and many appear to carry very little baggage. Another subject for field research.

Businessmen will use a service only if the regularity is high. This has not been the case with some of the internal services, principally because of inadequate facilities at the provincial airport. Better facilities would be justified by a high density of service. When another vehicle takes over some of the inter-city services, large provincial towns should be generating numerous direct international flights, so money spent on airports should not go down the drain in a few years' time.

London, W.C.2. A. J. LUCKING.

## Airworthiness and the Clubs

REFERRING to your leader on "Clubworthiness" in your issue of December 7, I enclose a copy of the letter which this Association has sent to the Ministry of Transport and Civil Aviation, and which does, in fact, follow up your proposals. We feel that this may be of considerable interest to your readers.

London, W.1. M. O. IMRAY,
Secretary, the Popular Flying Association.

[We give below the main portion of the text of the P.F.A.'s letter to the Ministry—Ed.]

"At the present time co-ownership groups operating light aircraft on training programmes for their members are specifically exempted from maintenance to public transport aircraft standards by M.T.C.A. letter.

"There are certain organizations wishing to affiliate themselves to the Popular Flying Association, whose aims are similar to those outlined in our membership rules, but whose organization is such that it is necessary for them to employ flying instructors.

"Already it is established that where an instructor and pupil are members of the same club, the fact that payment is made for flying instruction is not deemed as flying for hire and reward.

"It is submitted for consideration that a clear declaration to the effect that co-ownership groups and members' clubs whose affairs are in the hands of duly appointed trustees, are not operating for public transport, should be made. Such a declaration would confirm the submission of this Association that such is in fact already the case in law.

"Attention is drawn to the lack of public transport type regulations affecting motoring, gliding, sailing, ski-ing, and other sporting organizations where members join of their own volition and appreciate the comparative risks involved, compared to other sporting activities. It is suggested that the relationship between a member and a flying club is not such as exists between such a club and a casual member of the public.

"It is suggested that by suitable model rules applicable to all such bodies, and a display of disclaiming placards in concerned aircraft, the member is clearly protected against any assumed ignorance. It is further suggested that adequate protection is afforded by insistence on minimum insurance cover.

"Already the value of the Royal Aero Club three-year Certificate of Airworthiness is established and it is proposed that Certificates of Airworthiness applicable to aircraft used as above could, if desired, either have the (f) Crew familiarization added to the sub-division (d) Private, or alternatively the sub-division (d) should be amended to read (d) Private, Club or Group flying. Either of these as an optional alternative to the present Certificate of Airworthiness in all sub-divisions of the Normal Category.

"From investigations carried out by this Association both in the U.K. and France, where similar bodies to Popular Flying Association Groups form the basis of the flying club movement, it can be confidently submitted that such a basis of operation does not involve any lower standards of maintenance, and that members are individually more safety-conscious than hitherto.

"Additionally, certain organizations proposing to affiliate to this Association are operating as proprietary clubs and as such are acknowledged under the present regulations as operating public transport. It is equally submitted on behalf of any such associated clubs, that the same general principles as before proposed should apply to these bodies. It is accepted that in view of the quasi-commercial interests of the proprietors of such clubs that there may be considerations justifying more frequent certification of maintenance checks and it is for consideration that the present 'ten hour' check in the Royal Aero Club maintenance schedule should be signed for, in the appropriate log books, when such aircraft are operated by proprietary clubs, most of whom in any case employ a full-time qualified engineer.

"The proposals contained in this memorandum have been considered and agreed by the members of the Executive Committee of the Popular Flying Association, and are being submitted to the Royal Aero Club of the United Kingdom, as the controlling body for sporting flying, for their endorsement and support to the proposals contained herein. Additionally, the text is being circulated to other bodies qualified to make representations on behalf of sporting flying interests."

# THE INDUSTRY

## Aircraft Taper-roller Bearings

DURING a recent visit to the Duston, Northampton, works of British Timken, Ltd., we were able to learn something of the considerations involved in the design and production of taper-roller bearings for aircraft applications.

It is hardly necessary to say that British Timken are specialists, in the truest sense of the word, in taper-roller bearings (a subsidiary, Fischer Bearings Co., Ltd., makes ball and parallel-roller bearings; they are used in, among other aero engines, the Avon and Dart). Taper bearings are manufactured in hundreds of sizes and for every conceivable transport and industrial application. Numerically, therefore, the output for the aircraft industry is a small fraction of the whole; but for most aircraft bearings the design problems are of a special nature dictated by size, volume and other considerations.

In the first place, though the bearing must have the designed load capacity, excess capacity can seldom be afforded; secondly, it must be as light as possible, and, usually, of the most compact shape; and it must have low friction characteristics, particularly where the motion is oscillating as distinct from rotating.

In spite of such limitations, Timken aircraft bearings are almost all available in the standard range, full data on which appear in the *Engineering Handbook* published by the company; "specials" are the exception rather than the rule.

One of the most usual applications is for aircraft wheels, and here the bearing is basically of conventional design, designed to carry a combination of radial and thrust loads, though the races are usually of considerably lighter section than would be employed in a comparable surface-transport or industrial application. Bearings of this type are used in the wheels of Bristol Britannias and other large aircraft. A more specialized component is the small-section, large-diameter bearing designed to surround a disc-brake assembly; at Duston we saw a bearing of this type which, made for a well known high-performance fighter, has an outside diameter of 18⅞in and bore of 16½in.

Another class of Timken aircraft bearing emphasizes the point that provision of a light section is not the only possible method of weight saving. Much can be done by adapting the exterior surfaces of the bearing—by flanges, threads, splines, and so forth

*British Timken large-diameter, light-section landing-wheel bearing and—shown dismantled in centre—propeller blade-root bearing.*

—to save weight in installation, the more cumbersome conventional methods of seating and retention being dispensed with.

This technique is particularly evident in the type of bearing developed for propeller and rotor-blade roots. Seen dismantled in the accompanying illustration is a two-row root bearing as used in the Rotol propellers on Viscounts. This bearing is designed to accept the very high centrifugal loads acting along its axis (hence the employment of rollers at a steep angle); to combine this with sufficient radial load-carrying capacity to keep the blade-root accurately centered on its axis despite the tilting loads imposed by air pressure, blade inertia, gyroscopic effects and similar factors; and to offer very low frictional resistance in pitch-changing movement from rest.

On its outer periphery the bearing has a ground thread, abutment flange and spanner dogs, thus dispensing with the need for a separate nut to retain it in the hub; and a series of drilled and tapped holes provides for attachment to the pitch-changing mechanism. Certain of the surfaces are copper plated.

Timken taper-roller bearings are made from case-hardening alloy steel, the component parts undergoing a rigidly controlled heat-treatment sequence. Material and dimensional inspection, also, is unusually thorough—even by aircraft standards—at all stages of the manufacturing process.

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## Bristol Sales Department Expansion

THE sales force of Bristol Aircraft, Ltd., is to be expanded by the formation of a sales engineering section. The new section, it is stated, "will integrate with the sales and design departments to provide full specialized technical information for operators throughout the world, and engineering liaison with existing customers."

It is to be headed by Mr. Alec Symon, A.R.Ae.S., who, for the past five years, has been manager, under Dr. Russell (director and chief engineer) of the Britannia design office. With the title of manager, sales engineering, Mr. Symon will be directly responsible to Mr. Roger White-Smith, who now takes the title of general sales manager, and who is in turn responsible to Mr. W. R. Farnes, sales director.

Mr. Symon, who is 53, joined the drawing office staff of the Bristol Aeroplane Co. under the late Captain Barnwell in 1919. In later years he supervised design of the Bombay, Blenheim, Beaufort, Beaufighter, Bisley and Buckingham aircraft. In 1943 he became assistant chief designer, and was responsible for co-ordinating design work on the Freighter, Brabazon and Britannia projects. In 1952 he was appointed Britannia design manager.

*Mr. Alec Symon.*

*Mr. Roger White-Smith.*

Mr. Roger White-Smith, now 32, joined the company in 1947 after war-time service with the R.A.F. Following some months as a business trainee, he was appointed assistant to the chief personnel manager, and subsequently personal assistant to Sir (then Mr.) Reginald Verdon Smith. Transferring to the sales department of the aircraft division (as it then was), he was appointed deputy sales manager in 1955.

# IN BRIEF

The Fairey Aviation Co., Ltd., announces the appointment of Mr. L. S. Dawkins as secretary of the company. He succeeds Mr. J. C. Macpherson, who was recently appointed financial director, and is himself succeeded as chief accountant by Mr. D. W. Lee-Smith.

* * *

Mr. H. L. A. Foy has been appointed publicity manager of Decca Radar, Ltd., in succession to Mr. S. J. Mattock, who recently left the company. Mr. Foy joined Decca two years ago after serving in the Royal Navy as a specialist navigating officer.

* * *

Canadair, Ltd., state that a recent report that the West German Ministry of Defence had placed an order for 225 Sabres with the Canadian Government should, correctly, have stated that the order was concluded with Canadair, Ltd.

* * *

Sangamo Weston, Ltd., give news that Mr. H. A. Springer, A.M.I.E.E., has been appointed joint managing director with Mr. C. H. Bacon. Mr. Springer joined Sangamo Weston in 1932 and has held various positions in the production and contracts departments. In 1952 he was appointed contracts manager and became a director in 1953.

* * *

Aviation and General Insurance Co., Ltd., announce the appointment of Mr. C. R. Jeffs as joint assistant underwriter, with effect from January 1. The directors have expressed "their appreciation of the friendly and helpful consideration shown towards the 'Aviation and General' by the directors and management of the British Aviation Insurance Co., Ltd., by arrangement with whom and with whose best wishes Mr. Jeffs takes up his new appointment."

*The long-range Britannia 312 is seen here at Filton—early in the morning of December 31—at the moment of becoming airborne for the first time.*

# CIVIL AVIATION

## BRITANNIA 312 FLIES

THE first of the long-range Britannias—a 312 intended eventually for service with B.O.A.C. but as yet in Bristol Aircraft colours—made its first flight on December 31. Filton thus saw two outstanding first flights in 1956; the forebear of the 312, the Britannia 301, flew on July 31. Flown by W/C. Walter Gibb, the new aircraft, G-AOVA, was airborne for 1 hr 20 min. In addition to the pilot, there was a flight-test crew of five.

Of the 65 Britannias on order, 26 are of the Series 310 type which, like the 300 series, are powered by Proteus 755 engines each developing 4,120 e.h.p. The long-range aircraft is practically identical with the Series 300 except that the fuel-tank capacity has been increased to 8,486 Imp. gal, giving a still-air range of 6,000 miles. The close similarity between the 300 and 310 has enabled Bristol to get C. of A. flight trials under way for the long-range version by using the 301 prototype: G-AOVA will undergo a further series of tests before being delivered to B.O.A.C.

The Britannia 312 will be capable of year-round non-stop crossings of the North Atlantic, and—together with B.O.A.C.'s DC-7Cs—it could be operated on the trans-polar routes which the Corporation has under consideration.

It has been announced that the Britannia 100s, which will go into service between London and Johannesburg on February 1, will be introduced onto the Kangaroo Route to Sydney on March 2. There will be three flights a week from London Airport, leaving on Mondays, Wednesdays and Saturdays. One flight will be all-first-class; the others will be mixed. The first service in the opposite direction will leave Sydney on March 5.

Journey-time from London to Sydney—the B.O.A.C. Constellation service night-stop at Singapore will be discontinued—will be reduced on Britannia flights from 75 hours to 47, and the return journey will take 51 hours instead of 75.

## ROUND THE WORLD IN FOUR DAYS

TRANS WORLD AIRLINES have been granted a major extension of their route mileage by the U.S. Civil Aeronautics Board. Their efforts to establish a globe-encircling network (the trans-Pacific link is flown by Northwest) have been recognized by the Board examiner and approved—as must all route authorizations—by the C.A.B. and President Eisenhower.

By granting T.W.A. permission to operate into Bangkok and Manila, C.A.B. has extended the airline's network by 2,900 miles over the existing 12,150 east-about miles between the company's present terminals of San Francisco and Colombo. The C.A.B. point out that Manila generates nearly twelve times as many passengers as Colombo and should provide the airline with the necessary "firm route anchor." The authorization will be reviewed in 1959.

According to T.W.A.'s senior sales vice-president, Mr. E. O. Cooke, the number of people who travel around the world has increased from about 6,000 in 1952 to nearly 15,000 a year at the present time. He expects this number to double again by 1960, because "round-the-world travel is the ultimate goal of all tourists."

T.W.A. are using their newly won route extensions to advertise a round-the-world service which occupies less than four days—a breathtaking prospect for a breathless long week-end. The tourist fare from London will be £481 and the service can be flown westerly (starting on one of T.W.A.'s regular transatlantic flights) or eastbound (starting from Paris). At Manila the connection for San Francisco is flown by Northwest Orient Airlines—Northwest's advertisement name—to re-join T.W.A.'s westerly extremity of their routes on the U.S. West Coast.

## ITALIAN AIRLINE CONTROL

THE background to recent rumours of an impending merger between Alitalia and L.A.I. (referred to in these pages last week) is filled in by a dispatch from our Italian correspondent.

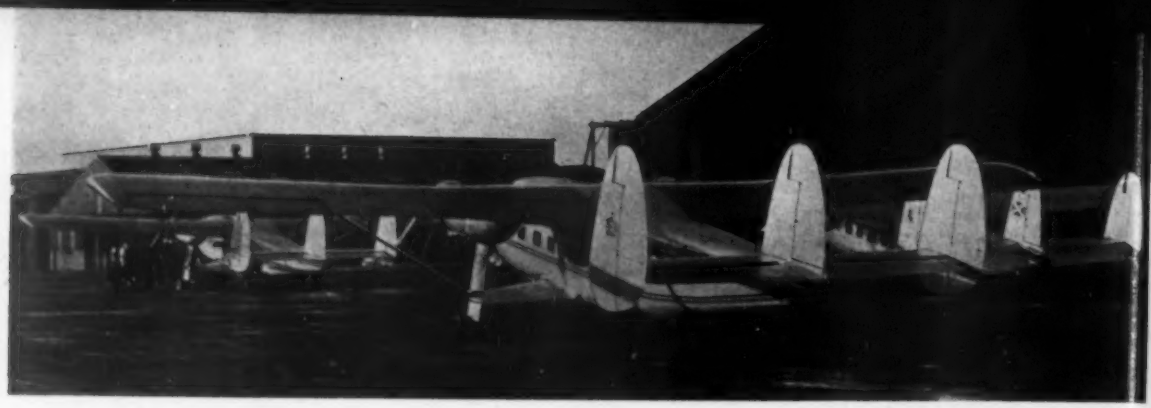
On December 22 [he writes] a DC-3 of the Italo-American airline L.A.I. crashed in the Alps near the Austrian frontier, causing the death of the 21 people on board. The aircraft was flying the daily Rome-Milan service and had gone some 93 miles off its route. In November a DC-6 of the same company crashed after take-off from Paris (Orly) for New York, almost all those on board losing their lives.

These two successive accidents have aroused public and Press opinion, and the Government is now looking into the matter. For the moment the principal result is the replacement of some L.A.I. directors, but it seems that there is a move towards the merging of L.A.I. and the Anglo-Italian company Alitalia. This [says our correspondent] would almost certainly have distinct advantages, though competent technicians hope that control of civil aviation will not be taken away from the Air Ministry. Certain politicians have tried to do so in the past and are trying to do so again now. They seek to justify themselves by enlarging on a crisis in which it is nevertheless easy to discern that neither the Air Ministry nor its air traffic assistance services are in the least implicated.

Pilots of foreign companies who have entrusted their safety to the Italian traffic-control services have always appreciated the qualities of the personnel; and, if the ground stations are not at the moment numerous, that is only because the budgets allocated to the Air Ministry have always been small, although the Ministry has used them wisely.

It is to be hoped [the correspondent concludes] that Italy's civil aviation organization, and particularly the efficient traffic-control services, will not suffer damage in the process of resolving this otherwise purely national problem.

***On January 2—on the eve of the announcement of T.C.A.'s Vanguard order—Lord Douglas of Kirtleside opened a public exhibition built around the aircraft that put Vickers firmly on the American map. "The Viscount Exhibition—a Story of Achievement in British Civil Aviation" will remain open at Selfridges', London, until January 15.***



## CIVIL AVIATION . . .

*Assembled at Prestwick alongside the Twin Pioneer prototype G-ANTP, before "going foreign," are G-AOEO for Swissair and G-AOEN, the American demonstrator (also seen climbing away on the left). The crew of the third Twin Pioneer to seek new frontiers last week-end line up in front of their aircraft before departure for Australia.*

## OUTWARD BOUND FROM PRESTWICK

THE photographs on this page illustrate a recent busy week-end at the Scottish Aviation works at Prestwick. Between January 4 and January 6 three Twin Pioneers left to scatter across the globe almost as far from one another as it is possible to travel—one to the Far East and Australia, one to North and South America and one to make a Continental tour before delivery to Switzerland.

First away, to the accompaniment of good wishes from the managing director (Mr. D. F. McIntyre), the staff and the relatives of the crew—and with an 18,000-mile itinerary before it—was G-AOEP, a brand new aircraft in Scottish Aviation's blue and white and bearing the company's crest of a lion and heart on the nose and outer fins. The long journey to Australia was to be flown *via* Lyons, Nice, Milan, Rome, Athens, Ankara, Baghdad, Teheran, Kuwait, Karachi, and so to India and Malaya through Delhi, Rangoon, Bangkok, Kuala Lumpur, and Singapore; the Twin Pioneer will then fly to Kuching (Sarawak), North Borneo, Manila, New Guinea and on to Hobart, Australia.

The pilot, Mr. Roy Smith, expects to give demonstrations to the R.A.F. at Kuala Lumpur (who are to be equipped with Twin Pioneers) on the way out; and the tour is a sales tour in the exact sense: the aircraft will be sold wherever—be it Sydney or Singapore—or whenever the opportunity occurs. The company judge that, apart from the requirements of the R.A.F. in still-troubled Malaya, the most likely prospects on this flight are to be found in Australia, where the Pioneer's versatility can be turned to good advantage. The versions that are being offered include passenger transport; freighter; air ambulance for nine stretcher cases, two walking casualties and two attendants; a crop duster and sprayer; and a survey variant. The company are also hoping to produce a seaplane Twin Pioneer; negotiations are proceeding with the Edo company for the manufacture of floats.

The arrangements for this simultaneous exodus of three demonstrators from Prestwick have been in the hands of Noel Capper, Scottish Aviation's chief test pilot. The aircraft to be used on the American tour, G-AOEN, is being flown out to him in Montreal by Capt. Clyde Pangborn, an American free-lance ferry pilot. All the demonstration aircraft are the long-range version with additional 30-gal tanks in each wing; but EN is also equipped with a long-range tank mounted in the fuselage for the North Atlantic crossing. Mr. Capper will start the demonstration tour at Montreal and fly *via* Ottawa, Washington and the Bahamas to South America, where the Twin Pioneer will be extensively demonstrated. Afterwards the aircraft—if not sold for outback service *en route*—will be demonstrated in the West Indies.

The second pilot on these flights will be Mr. T. Holiday, who, although he has only recently joined Scottish Aviation, has gleaned much previous valuable Pioneer experience in R.A.F. operations from Malayan jungle airstrips—work in which a 104yd run to unstick becomes of more than academic interest.

By the time the Australian and American tours are completed, Scottish Aviation will have accumulated some valuable experience of operations under the varied climatic conditions offered by Montreal in mid-winter or tropical Borneo; experience that will be backed-up by fully instrumented tropical trials with another aircraft, G-ANTP, in about three months' time.

The third departure from Prestwick last week-end was G-AOEO, flown by Capt. Tommy Hope. This aircraft is to make a Continental tour before being delivered to Swissair at Zurich, where Mr. Bob Daley, group inspector of Twin Pioneers at Prestwick, will remain behind to familiarize the airline personnel with the routine of maintenance and inspection.

## THE STERN FACE OF C.A.B.

A U.S. Court of Appeals decision last month upheld a C.A.B. action which put four American "non-scheds" out of business. The four companies—20th Century Air Lines, Trans National Airlines, Trans American Airways and Hemisphere Air Transport—were members of the "North American Combine" which was accused by C.A.B. of constituting themselves as a single airline in order to evade Board regulations.

The court said that there was evidence that the combine had presented itself to the public as "regularly or frequently operating one or more aircraft between designated points." They also agreed that flight announcements and advertising were in the name of "North American" and that practically all the aircraft used this name exclusively on the fuselage sides.

*The outlook from the Lockheed Super-G Constellation. The pronounced perspective effect sharply reduces the pilot's visibility through the starboard windows.*

# Cockpit Comparison

BY means of a special camera placed in the first pilot or driver's seat, the U.S. Civil Aeronautics Administration Technical Development Station at Indianapolis obtained "swivelling-eye-view" pictures from three airliner cockpits and—for comparative purposes—a typical American car. Each photograph is reproduced to the same scale and has been printed with the reference points (the pilot's focal point when looking straight ahead) in line. To make the comparison more effective the C.A.A. workers imposed a faint vertical and horizontal scale, although, owing to the differing proximity of the windows to the pilot's eyes, the horizontal ordinates cannot be used for a direct comparison. The lines on the vertical scale are about 5½ degrees apart; the superiority of the car in azimuth visibility is self-evident.

*The lowered sill of the nearside port window of the DC-7 provides good visibility for ground manœuvres. The pillar width is rather obtrusive.*

*In the Viscount, the deep windscreen and windows make for a visibility level that is good by airline cockpit standards.*

*The interior of a 1953 Ford Tudor Sedan, which is acknowledged to provide good visibility by motor-car standards. The driver's horizontal vision extends nearly 360 degrees.*

## CIVIL AVIATION . . .

### TO THE CONTINENT—BY CAR FERRY

WINTER cheer for car-owners who are contemplating taking their vehicles to the Continent during the coming year is provided by Silver City's announcement of fare reductions on their cross-Channel services. With the assurance of the French Government that ample petrol—88 gallons per car—is to be allowed to visitors, Silver City can expect to carry a record number of travel-hungry passengers in 1957. Similar petrol-allocation arrangements for tourists are also being made in Germany, Italy, Spain, Greece and Portugal. The Silver City car ferry, in spite of the increasing expansion of the Roadair service (which trebled in size in October) is still regarded by the company as their primary service.

The new vehicle fares have been arranged in three grades. The highest, "A" rates—still cheaper than the 1956 fares—apply to the week-end rushes in mid-season and will be in force for a total of 46 days of 1957. "B" fares—on 102 days of the year—are charged for mid-week summer travel during the busy season, and "C"-grade rates (the lowest) will apply to all flights during the remaining 31 weeks of the year. As the vehicle fares vary proportionately with overall length and the particular cross-Channel route—Ferryfield - Le Touquet, Ferryfield - Ostend, and Southampton to Deauville or Cherbourg—it is difficult to quote any particular fare; but the single-fare reductions range from 10s to £9 10s and the off-peak fares have been "more generously distributed." The new rates are the result of expanding operations by Silver City over several years and were planned some time before petrol rationing was contemplated in Britain.

The busiest cross-Channel route is the short and very popular Ferryfield - Le Touquet service: sixty flights a day in each direction, with extra flights available if necessary, are scheduled for the summer. The Ferryfield - Calais service does not lag far behind. High-season frequencies of this order underline the very severe seasonal traffic problem with which Silver City is faced. As their traffic is composed so largely of holidaymakers it dwindles severely in the winter season. Yet the company say that at peak periods, such as August Bank Holiday, they could use three times their present fleet of Bristol Freighters. The apparently obvious solution—the operation of a 24-hour, round-the-clock service—is out of reach. Although both Le Touquet and Ferryfield are equipped for night-flying, aircraft cannot be operated by casual labour, and the employment of the full complement of airport staff is a recurrent winter problem.

Part of the company's formula for successful operation has been to increase the fleet, yet annual utilizations of 1,000 hours are currently being achieved. Five new Mk 32s were added in 1956, but as two of these only came into operation at the very end of the year they will contribute to an increased effective strength of 21 aircraft—14 of which are Mk 32s—in 1957. All the aircraft are allocated primarily to carry passengers and cars on the air ferries; only when it has been definitely established that the capacity will not be required is an aircraft made available to the freight manager for allocation to the secondary rôle of cargo operations.

More aircraft will require additional crews to fly the summer services; but the nature of the cross-Channel operations means that the men concerned can base themselves in the Ferryfield area and live at home each night of the week: Silver City do not think that extra crews will be difficult to find.

Within a service so beset with seasonal variations there is considerable scope for efficient administration. That this is present in ample measure in the company organization is evident from the increasing business—both vehicle and mixed-freight—that is being obtained and the reduced vehicle fares that are being offered. Even so, the centralization of the administration sections in the new building being built in Knightsbridge, London, should make the task of efficient organization considerably more convenient.

### . . . OR BY COACH-AIR-RAIL

INTRODUCTION by Skyways of new coach-air routes to the Continent (the subject of a Brevity on these pages last week) offers point-to-point fares that are competitive with any other method of travel. Apart from the London - Lympne - Lyons - Nice route—which has recently received provisional approval and will be the first to come into service—Skyways' coach-air-service aircraft will fly to Vichy and Valence, and the very successful London-Paris operation will be continued with frequencies stepped-up to 16 return services a day at peak periods.

Another company offering "startlingly economical" air-and-surface travel to the Continent is Air Kruise, who have announced a new "Blue Arrow" coach-air-rail service from London to the Côte d'Azur, Italy, Costa Brava, Spain and the French Alps. A coach feeder-service will be operated from London to Ferryfield, to connect with the company's Arrow Class air service to Lyons. From the French air terminal the journey will be continued on the Rapide railway network. The return fare to Nice, for example—the single journey will take about 12 hours by this Air Kruise service—is not expected to be more than £20. Provisional approval has been obtained for the "Blue Arrow" service, which is expected to start in March and function—at varying frequencies—all the year round.

## BREVITIES

Aerovias Ecuatorianas (A.R.E.A.) has ordered a Fairchild F-27 Friendship. It is the first South American airline to do so.

* * *

It is reported from Australia that a 10,000ft runway is to be built on Easter Island.

* * *

Air Kruise carried 19,010 inclusive-tour passengers in August. During the complete year, the total reached 75,000. The previous year's figure was 44,000.

* * *

A C.A.B. examiner has recommended that a polar route to Europe from Los Angeles and San Francisco be authorized for T.W.A. and PanAm.

* * *

Mr. G. W. W. Dodd has been appointed sales promotion manager at B.O.A.C.'s head office. He was formerly district sales manager in Toronto.

* * *

An agreement has been signed in Rio de Janeiro between Japan and Brazil, who are planning to link the two countries with direct airline connections.

* * *

A new scale of pay affecting pilots employed by eleven independent operators has been awarded by an industrial court. The rates vary from £850 a year for Grade H pilots to £2,750 a year for Grade A.

* * *

Comments are invited from pilots using two prototype high-intensity angle of approach indicators which are to be sited on the left-hand side of the 26 runway at Bournemouth (Hurn). They will be at 1,000 and 500ft from the threshold.

* * *

A proposal for air services between Colombo and Canton is being negotiated between the Ceylon and Chinese Governments. Air Ceylon's profits for the next financial year are estimated to be about Rs 300,000. The airline's finances are stated to be "very stable."

* * *

M. Bernard Duperier, whose office is in Paris, has been appointed a consultant to Boeing's transport division.

* * *

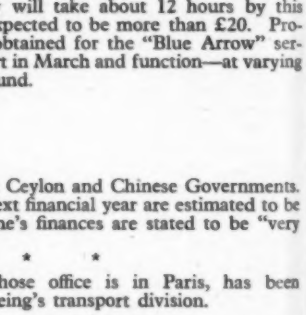
The Civil Aviation Administration of China claim to have had seven accident-free years.

* * *

Dr. Kenneth Bergin, M.A., M.D., D.P.H., F.R.Ae.S., B.O.A.C.'s Medical Superintendent, Air Services, has been appointed chief medical officer of the Corporation.

* * *

Since its first flight on October 22 the first Lockheed L-1649 Super Star Constellation has logged more than 125 flying hours. First commercial delivery is scheduled for April (T.W.A.) followed by Air France in June; output is being set at seven aircraft per month.



*Mr. J. R. T. Bradford, O.B.E., T.D., A.F.R.Ae.S., has been appointed by Bristol Aero Engines Ltd., to undertake market research concerned with airline operating statistics. He will be directly responsible to B.A.C. director Dr. Hooker.*

*Among recipients of honours in the New Year's List are, left to right, Air Chief Marshal Sir Dermot Boyle (G.C.B.), Air Marshal H. L. Patch (K.C.B.), Air Marshal A. McKee (K.C.B.) and Air Chief Marshal Sir Francis Fogarty (G.B.E.).*

# SERVICE AVIATION

## NEW YEAR HONOURS AND AWARDS

THE New Year Honours list, published last week as a special supplement to the *London Gazette*, includes the names of a number of R.A.F. recipients of honours in the military divisions of various orders.

Among senior officers named below, Air Chief Marshal Sir Dermot Boyle is Chief of the Air Staff, and Acting Air Marshals H. L. Patch and A. McKee are respectively C-in-C. Middle East Air Force and A.O.C-in-C. Transport Command. Air Chief Marshal Sir Francis Fogarty was, until December 31, Air Member for Personnel. Since the list was published, a number of the officers concerned have been confirmed in rank (see news item overleaf).

### ORDER OF THE BATH

*Knight Grand Cross:* Air Chief Marshal Sir Dermot A. Boyle, K.C.V.O., K.B.E., C.B., A.F.C.

*Knights Commanders:* Acting Air Marshal H. L. Patch, C.B., C.B.E.; Acting Air Marshal A. McKee, C.B., C.B.E., D.S.O., D.F.C., A.F.C.

*Companions:* A.V-M. J. L. F. Fuller-Good, C.V.O., C.B.E.; A.V-M. M. L. Heath, O.B.E.; A.V-M. J. C. Neely, C.B.E., D.M., B.Ch., M.R.C.S., L.R.C.P., D.O.M.S., D.O.(Oxon), Q.H.S.; A.V-M. G. L. Worthington, C.B.E.; A. Cdre. E. S. Butler, O.B.E.; A. Cdre. A. E. Clouston, D.S.O., D.F.C., A.F.C.; A. Cdre. D. S. Radford, D.S.O., D.F.C., A.F.C., A.D.C.; A. Cdre. A. M. Rodgers.

### ORDER OF THE BRITISH EMPIRE

*Knight Grand Cross:* Air Chief Marshal Sir Francis J. Fogarty, K.C.B., K.B.E., D.F.C., A.F.C., A.D.C.

*Knights Commanders:* Acting Air Marshal The Rt. Hon. P. R. Gardner, Earl of Bandon, C.B., C.V.O., D.S.O.; Acting Air Marshal G. W. Tuttle, C.B., O.B.E., D.F.C.

*Commanders:* A. Cdre. R. W. L. Glenn; A. Cdre. C. E. Hartley; A. Cdre. C. J. Nobbs; A. Cdre. M. E. M. Perkins, B.A., A.F.R.Ae.S.; A. Cdre. J. E. R. Sowman; Group Captains A. G. Douglas, M.C.; C. H. Hartley, O.B.E., D.F.C., A.F.C.; S. W. B. Menaul, D.F.C., A.F.C.; S. C. W. Rudd, M.B.E.; F. W. Thompson, D.S.O., D.F.C., A.F.C.; F. F. Wicks, O.B.E., D.F.C., A.M.I.E.E., A.F.R.Ae.S.; Acting Group Captain P. H. Cribb, D.S.O., D.F.C.

*Officers:* Acting Group Captain W. T. Brooks, D.S.O., A.F.C.; Wing Commanders T. J. Da Costa Andrade; L. H. Baker; E. J. Brice, D.Phys.Ed.; P. W. G. Burgess; J. H. Hunter-Tod, M.A., A.F.R.Ae.S.; A. J. Mott, A.F.R.Ae.S.; H. G. Oates, Malayan Aux. A.F.; G. J. Pearn; J. D. Thirlwell, D.F.C.; Wing Officer C. E. Warren, W.R.A.F.; Acting Wing Commanders R. F. J. Barber; C. C. McCarthy-Jones, A.F.C., R.Aux.A.F.; R. C. Preston, A.F.C., R.A.F.V.R.; G. Steele, M.B.E.; Sq/O. M. Dixon, Princess Mary's R.A.F. Nursing Service; Squadron Leaders F. W. Dowling; F. A. Drury, D.F.C. (Retd.); S. Green; P. M. S. Hedgeland, M.B.E., B.Sc.(Eng.), A.M.I.E.E., A.C.G.I.; E. J. McDonald; G. A. Podevin; D. D. Thompson.

*Members:* Squadron Leaders G. J. Aylett; P. G. Farley; E. Goodrick; D. A. Joss; Acting Squadron Leaders R. W. Bracken; J. A. V. McDonagh, R.A.F.V.R.; A. Sharman, R.A.F.V.R.; L. Wood, D.F.M.; Flight Lieutenants G. Allen-Rowlandson; W. Appleton (Retd.); E. Attwell (Retd.); F. W. Benson; G. D. Broadhurst; F. J. Bull; W. G. Daynes, D.F.M.; B. Ewart; L. Firth; C. Heseltine; E. J. B. Hopkins; W. T. Joyce; E. P. Ledlie, R.A.F. Regt.; D. B. Macfarlane, B.E.M.; E. O. Mackay; Flt/O. B. Mills-Thomas, W.R.A.F.; Flight Lieutenants H. A. Probert, M.A.; H. A. Riddiford; W. Robinson; L. B. Spink; G. J. Thwaites, R.A.F. Regt.; Flt/O. E. P. M. Westbury, W.R.A.F.; Flying Officers S. H. Hanson, R.Aux.A.F.; T. C. Kerr; Mulazim Ali Ahmed Audhali, Aden Protectorate Levies; Warrant Officers D. Broad; W. J. R. Gent, B.E.M.; D. E. J. Murray; C. F. Pummery; A. J. Randell; J. H. Slater; C. J. Strevens; R. C. Walker; J. W. Wilson; M.Tech. D. J. Livett; Acting Warrant Officers M. Mitchell, W.R.A.F.; G. V. Watkinson.

### AWARDS

*Bar to Air Force Cross:* W/C. P. W. Helmore, D.F.C., A.F.C.

*Air Force Cross:* Wing Commanders C. A. Alldis, D.F.C.; R. F. B. Powell; T. N. Stack; Squadron Leaders L. G. A. Bastard; J. N. B. Boyd; D. H. Chopping, D.F.C.; A. D. Dick; E. J. G. Flavell; A. Harper; D. L. Hughes, D.F.C.; M. F. J. Mathews; D. H. Tew; Acting Squadron Leader P. E. Fahy, D.F.C.; Flight Lieutenants P. E. Bairsto; M. O. Bergh; F. A. Bernard; J. D. Bradley; G. N. Brierley, D.Phys.Ed.; R. J. T. Buchanan; B. W. T. Coomer; D. G. T. Franklin; R. E. Jefferies; E. G. Jones, D.F.C.; G. J. A. Kerr; P. H. J. Peters; E. J. Shaw; J. E. Smith; E. Stacey; J. Stanley; C. C. Verry; I. G. Warren; F/O. E. Vine; Lieutenant Commanders C. McKeand Little, R.N.; D. M. Steer, R.N.

*Royal Red Cross (First Class):* W/O. H. N. B. Grierson, A.R.R.C., Princess Mary's R.A.F. Nursing Service.

*Royal Red Cross (Second Class):* Sq/O. C. E. Robertson, Princess Mary's R.A.F. Nursing Service.

*Air Force Medal:* Flight Sergeants W. H. Black; T. Currie; K. Dillon; G. N. Franklin; G. R. Lee; C. J. B. Murdock; Sergeants J. A. McCubbin; A. P. Tizzard.

*British Empire Medal (Military):* Flight Sergeants P. E. Dewsbury; M. F. C. Downie; H. Farrow; G. L. Fisher; L. Heaword; M. P. Hennessey, W.R.Aux.A.F.; J. Houston; H. E. Jeffries; N. Johns; J. P. Murphy; (now Master Coxswain) G. A. W. Peters; L. F. Pollard; D. J. Roden; C. Rutter; S. Tuckerman, R.Aux.A.F.; (now Acting Warrant Officer) J. W. Westhead; G. W. H. Weston; A. J. Winterflood; C/Tech. O. W. Clinton; Acting Flight Sergeants A. E. Catling; G. S. Crisp; A. R. Freeman; L. B. Griffiths, W.R.A.F.; L. W. Grimson; P. M. Salter; D. R. Schofield; Sergeants P. T. Allmond; R. H. Ambler; E. G. A. Braden; C. C. J. Castle; C. H. Cowley; E. T. Crabb; W. J. Findlay; K. D. Flatt; C. H. Forbes; W. Johnston; P. J. Moloney; J. W. Moles; C. K. Smith; R. S. Spoors; A. P. Summers; S/Tech. A. E. Haggas; Corporals P. J. Seddon; D. W. Weymouth; D. M. Wood; Cpl. Tech. C. H. Martin.

*Queen's Commendation for Valuable Service in the Air:* Wing Commanders C. C. Calder, D.S.O., D.F.C.; J. S. Owen; R. S. Radley, D.F.C., A.F.C.; Squadron Leaders C. E. Butterworth; T. J. McElhaw; A. E. Marriott; P. H. L. Scott, A.F.C.; J. R. Tanner; G. W. W. Waddington, D.F.C.; C. Watkinson, D.F.C., A.F.C.; K. C. Wilson; Flight Lieutenants R. G. F. Ainsworth; D. W. E. Allum, D.F.C.; R. J. H. Ansley; A. Bountiff; A. J. Camp, A.F.C.; E. S. Chandler, A.F.C.; T. M. Coulson; P. S. Demmer; E. R. Gordon; H. D. Hall; R. Harling, D.F.C.; R. J. Johnston, R.Aux.A.F.; H. A. Maule, A.F.C.; J. Maxwell; D. F. Moffat; R. H. Mullineaux; K. T. A. O'Sullivan, D.F.C.; R. Prest; J. V. Radice; A. Sedivy, D.F.C., D.F.M.; R. A. F. Shields; D. A. Spackman; A. C. Thornton; Flying Officers W. Houldsworth; W. G. Kirkman; P. H. Warwick; F. E. Winch; P/O. C. Taylor; M.Plt. S. Wieczorek; M.Eng. A. Eldridge; Flight Sergeants R. H. Bunce; B. A. Collen, D.F.M.; H. A. Harrison; W. G. Holt; A. H. Hopkins; J. Milfull.

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**Commonwealth Forces:** The names of a number of officers and N.C.O.s of the Commonwealth Air Forces also appeared in the New Year Honours List, as follows:—

### ORDER OF THE BATH

*Companion:* A.V-M. E. C. Wackett, R.A.A.F.

### ORDER OF THE BRITISH EMPIRE

*Commanders:* G/C. W. A. C. Dale, R.A.A.F.; A. Cdre. I. G. Morrison, R.N.Z.A.F.

*Officers:* S/L. M. B. Furlong, R.N.Z.A.F.; G/C. I. P. Godsell, R.A.A.F.; G/C. W. E. Townsend, R.A.A.F.

*Members:* W/O. R. D. Cook, R.A.A.F.; S/L. W. C. Hendy, R.A.A.F.; F/L. C. F. Laloli, R.N.Z.A.F.; W/O. W. D. Munro, R.A.A.F.; F/L. C. E. B. Papps, R.N.Z.A.F.

*British Empire Medal (Military):* F/Sgt. H. R. Brooks, R.A.A.F.; F/Sgt. J. M. Brown, R.A.A.F.; F/Sgt. K. J. Clark, R.N.Z.A.F.; Sgt. W. H. O'Byrne, R.N.Z.A.F.; Sgt. P. J. Weis, R.A.A.F.

*Air Force Cross:* S/L. E. T. C. Cunnison, R.A.A.F.; W/C. D. F. St. George, R.N.Z.A.F.; S/L. W. M. Golden, R.N.Z.A.F.; S/L. H. W. C. Thwaites, R.A.A.F.

## SERVICE AVIATION . . .

### Royal Air Force Promotions

THE half-yearly promotions which were published on January 1, and became effective on that date, include the confirmation of air marshal rank for several acting air marshals. They are Air Marshals H. L. Patch, A.O.C-in-C. M.E.A.F.; Sir John Whitley, Air Member for Personnel; A. McKee, A.O.C-in-C. Transport Command; The Earl of Bandon, C-in-C. 2nd T.A.F.; and R. G. Hart, Controller of Engineering and Equipment, Air Ministry.

Confirmed in the rank of air vice-marshal are Acting Air Vice-Marshal A. A. Adams, Chiefs of Staff Representative on Disarmament, Ministry of Defence; and Acting Air Vice-Marshal J. F. Hobler, A.O.A. M.E.A.F.

### C.F.S. Affiliation

THE first affiliation between a regular R.A.F. establishment in this country and its opposite number in another Commonwealth air force has now been officially approved by the Queen. It is between the R.A.F. Central Flying School at Little Rissington, Glos, and the R.N.Z.A.F. Central Flying School at Wigram, South Island. The New Zealand unit is commanded either by a R.A.F. officer on exchange, as at present, or by a R.N.Z.A.F. officer who has served on the C.F.S. staff in Britain.

The reason for the affiliation is to foster a close relationship by a regular exchange of information and by extension of hospitality to members visiting each others' country.

### Navy Uses Britannias

TO facilitate the recommissioning of the destroyer *Comus* at Mombasa, the Admiralty has chartered Bristol Britannias from B.O.A.C. to bring out the new ship's company. Last Sunday 90 officers and men, half the ship's company, left London Airport to fly to Entebbe, Uganda, where they were being picked up by East African Airways Dakotas. The other half of the crew was to leave London in a Britannia early this week. The old ship's company was returning to Britain in the same aircraft.

### "Bob" Martin of Wittering

THE many who knew F. ("Bob") Martin, for 30 years barman in the Officers' Mess at R.A.F. Wittering, will be grieved to learn of his death in a road accident. He leaves a widow and two children.

An officer at Wittering has written the following appreciation:—

"Wittering and the Royal Air Force have lost a loyal servant, well known to the many who have passed through the portals of the Officers' Mess from the days of C.F.S., 11 F.T.S., during Fighter Command's tenure after Munich and war days, through the occupation by C.S.D.E. and now as the birthplace of the 'V' Force in Bomber Command.

"Bob, as he was known to all, joined Wittering in 1926 as a batman and started barkeeping duties which were to last for the next thirty years. Having brewed the beer in his father's pub in Stamford, he was in his true element when the first 'official' bar opened in the mess early in the war. To see him on a Saturday night, handling the orders of a crowded bar, was to marvel at the brain that could retain figures in three dimensions, produce the goods and account for them, the whole time keeping up a repartee suitable for each customer.

"He never forsook his bicycle; rain, shine, snow, ice or bombs, he pedalled, it is estimated, some 75,000 miles in the employment of the service he loved."

*Lord Hailsham, First Lord of the Admiralty, being hoisted by winch into a Naval Whirlwind after opening the National Boat Show at Olympia, London, recently.*

### Mauripur Closed

THE R.A.F. staging post at Mauripur, the last of many such posts on the subcontinent of India, has now been closed. It was most recently under the direct control of H.Q. British Forces, Arabian Peninsula, at Aden. In future R.A.F. aircraft passing through Pakistan on their way to the Far East will stage through Karachi International Airport under arrangements agreed with the Pakistan Government.

Mauripur was originally established over 25 years ago; and, even now, the mooring masts and a hangar erected for the airships R.100 and R.101 are still standing. When India and Pakistan were made sovereign states in 1948, the R.A.F. station became a staging post on the large Royal Pakistan Air Force Base which was then established. Aircraft of many nations could regularly be seen on the airfield on their way to all parts of the world. Last year no fewer than 940 military aircraft of 13 different types were refuelled and serviced and 4,437 passengers were dealt with. The Movements Section unloaded 107,873 lb of freight which arrived by air.

### 1956 Hack Trophy

FOLLOWING the annual assessment of the 17 university air squadrons in Great Britain and Northern Ireland, Glasgow University Air Sqn. has been awarded the Hack Trophy for 1956. Nottingham U.A.S. was second and Manchester third. Glasgow won the trophy in 1954 and Nottingham came second in 1955.

The Hack Trophy was originally presented in 1943 by W/C. E. J. Hack. The competition includes flying and written tests for six selected officer cadets in each squadron, and inspection of the squadron's ground and flying-training facilities and its organization and record.

### Christmas Charities

IN the busiest Christmas season since 1945, fifty units in 2nd A.T.A.F. collected over £4,000 for gifts to various charities. These included Christmas parcels, clothing and cash gifts for German orphans, displaced persons, Hungarian refugees and the blind in Britain. More than 2,000 German children attended Christmas parties and shows organized by officers and airmen.

### Staff College Lecture Team

AT the end of this month a team of six officers of the R.A.F. Staff College, Bracknell, led by the Commandant, A.V-M. S. C. Elworthy, will visit the U.S.A.F. Air Command and Staff College at Maxwell A.F.B., Alabama. The team will give lectures on the rôle of the R.A.F., as part of the curriculum of the American college.

After three days at Maxwell, the team will fly to Canada for a three-day visit to the R.C.A.F. Staff College at Toronto.

### Sunderlands Retiring

AS we go to press it is announced that two of the remaining three R.A.F. Sunderland squadrons are being disbanded at the end of this month. They are Nos. 201 and 230 at Pembroke Dock. The Sunderlands will be replaced by Shackletons and the squadron numbers may be retained. The remaining unit is No. 205/209 Sqn. at Singapore.

### FORTHCOMING EVENTS

Jan. 11. Helicopter Association: "Analogue Computer Development with Reference to Helicopter Applications," by B. H. Venning, B.Sc. (Eng.), A.C.G.I., A.M.I.E.E.

Jan. 15. R.Ae.S.: Graduates and Students Section: N. E. Rowe Medal Competition: "Possible Flight Paths for Helicopters," by P. F. Sutherby. "Fins," J. Wolkovitch.

Jan. 16. Kronfeld Club: Film Show.

Jan. 23. Kronfeld Club: "Flying Reminiscences," by C. A. Nepean Bishop.

Jan. 24. R.Ae.S.: Main Lecture: "Aeronautical Research in Holland," by Prof. Dr. Ir. H. J. van der Maas.

Jan. 29. R.Ae.S.: Section Lecture: "Design for Production," by E. D. Keen.

Feb. 2. British Interplanetary Society: "Accelerations in Flight," by W/C. F. Latham.

Feb. 7. R.Ae.S.: Main Lecture, at Halton: "Synthetic Training Methods in Aviation," by W. Makinson.

Feb. 12. Joint R.Ae.S. and Helicopter Association Lecture: "Vibration Problems Associated with the Helicopter," by O. L. L. Fitzwilliams, A.F.R.Ae.S.

May 24-June 2. Paris Aero Show, Le Bourget.

Sept. 2-8. S.B.A.C. Show, Farnborough.

R.Ae.S. Branch Fixtures (to Jan. 30):—

Jan. 14, *Henlow*, "Aircraft Control," by Prof. G. A. Whitfield; *Southampton*, A.G.M. and Film Show. Jan. 16, *Christchurch*, "Problems and Prospects in Civil Air Transport," by P. G. Masefield; *Brough*, "Gliding," by J. C. Neilan; *Leicester*, "The Noise of Jet Engines," by F. B. Greatrex. Jan. 17, *Bristol*, "Wind Tunnel Instrumentation," by J. R. Anderson. Jan. 18, *Birmingham*, "Aerial Survey," by Mr. Dawe. Jan. 24, *Bristol*, "Application of Wind Tunnel Results to Aircraft Design," by M. Wilde. Jan. 30, *Preston*, "Diving and Underwater Engineering," by I. Fraser; *Southampton*, "Atomic Energy for Aircraft Propulsion," by J. E. Perkins; *Weybridge*, "Electronics and the Aircraft Industry," by Dr. C. F. Bareford.